THE SUGAR MANUFACTURERS' ASSOCIATION

(of Jamaica)

LIMITED

Mandeville. Jamaica, W.I.

ANNUAL REPORT

OF THE

RESEARCH DEPARTMENT

1960

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THE SUGAR MANUFACTURERS' ASSOCIATION (of Jamaica) LIMITED
RESEARCH DEPARTMENT

ANNUAL REPORT, 1960

A. INTRODUCTION AND SUMMARY

1. The Director attended meetings of the B.W.I. Sugar Research Scheme and the Advisory Committee of the B.W.I. Central Sugar Cane Breeding Station in Barbados in December.

2. During the year, the Director served on the following official bodies:—

(*a*) Advisory Council on Agricultural Development.
(*b*) Sugarcane Development Committee.
(*c*) Livestock Development Committee, and
(*d*) The Underground Water Authority.

3. Mr. C. E. M. Smith, agronomist, was away on overseas leave between 17th July and 19th September.

4. Mr. J. R. Metcalfe arrived on 18th October and assumed duties as Entomologist. Prior to taking up his post here, Mr. Metcalfe visited the Agricultural Experiment Station at Rio Piedras, Puerto Rico, where he had discussions with Dr. Martorell, Head of the Department of Entomology, and with Dr. Steiner, who is working on soil nematodes. Mr. Metcalfe also visited Rothamsted Experimental Station in connection with the study of nematodes and soil micro-Arthropods.

5. Mr. P. D. Manser left the Department to accept appointment as plant pathologist to the Government of Ghana.

6. The following junior staff changes occurred:—

Resigned: Misses N. H. Grant and G. N. King, Messrs. A. Davis, G. M. Mair and M. E. Walder.

Appointed: Miss I. Fong, Mrs. M. V. Weston, Messrs. L. R. Knight and L. Pitter.

7. The new buildings of the Department which were occupied in August, 1959, were officially opened on 13th February by the Premier, the Hon. N. W. Manley, in the presence of a gathering of the Minister of Agriculture, officials of the Ministry of Agriculture and Lands and other leading agriculturists.

8. The B.W.I. Sugar Technologists' Conference was held in Montego Bay, 14th to 18th November. The organization of the Conference was undertaken by the Department in association with Mr. R. Norris, Secretary of the B.W.I. Sugar Association (Inc.), and Mr. A. R. Bonitto, Administrative Officer of our Industrial Relations Department.

9. The Annual Sectional Meetings and Conference of the Jamaican Association of Sugar Technologists were held in conjunction with that of the B.W.I. Sugar Technologists' Association. Officers of the Department presented the following papers:—

"Sugar Cane Responses Obtained from the Use of Nematocides." R. F. Innes and T. Chinloy.

"The Effect of Temperature upon Cane Quality." R. F. Innes.

"Some Aspects of the Potash Nutrition of Sugar Cane Grown on a Heavy Clay Soil in Jamaica." M. E. A. Shaw.

10. Under the auspices of the Jamaican Association of Sugar Technologists, Factory and Field Days were held during the year. On 15th March and on 5th April, Factory Days were held at Innswood and Appleton, respectively. On 2nd and 19th April, Field Days were held at Caymanas and Sevens, respectively.

11. A total of 4,325,886 tons cane were ground, an increase of 13% on that ground for 1959. Of this quantity, 4,305,682 tons were used to produce 425,057 tons 96° sugar at 10·13 tons cane per ton 96° sugar. Estates produced 2,463,246 tons cane (an increase of 15·35% on 1959) whilst farmers supplied 43·06%.

12. The cane yield survey of sugar estates was continued. The average rate of sugar production was 5·96 cwt. per acre per month.

13. The use of varieties on estates was essentially the same as in 1959. There is an increasing awareness amongst estates' staff of the overriding importance of varieties of high quality but not on all estates is there an equal concern about the importance of maintaining standards in reaping operations.

14. B49119 is recommended for very limited semi-commercial trial planting in order to test its field reaction to the main areas of sugar estates and particularly in order to obtain enough material with which to carry out large-scale milling and factory tests. The variety tends to be thin and probably higher than average in fibre.

15. A selection of the varieties with any commercial potential and with the best juice qualities has been distributed to estates for limited trial and observation.

16. One hundred and sixty-six varieties of the B59 series have survived mosaic inoculation and are in selection nurseries.

17. Three hundred and forty-four varieties of the B.60 series were imported from Barbados.

18. The seedlings produced from fuzz amounted to 39,369. They will give rise to the BJ62 series.

19. Twenty-three varieties of commercial importance in other countries were imported.

20. The findings and conclusions of Mr. F. D. Bennett with respect to West Indian Canefly are presented, including some observations on the effect of insecticides on biological control.

21. The results of a small moth borer survey based upon a sample of 10% of the fields are presented. Average joint infestation was not high and there were little differences between the main commercial varieties. The same survey suggests that the damage from rats is small.

22. Meteorological data from four stations were circulated as well as the rainfall data for the industry. Again the winter months were warm and cane quality suffered. The harvest was generally wet, which caused much infield damage. The remainder of the year was also wet.

23. There is evidence that the standard of harvesting operations leaves much to be desired.

24. The results of cultivation experiments on heavy clay soils show the interdependence of the state of the soil at the time of cultivation and the type of cultural treatment advisable.

25. Work has been commenced on how to improve ratooning by judicious cultivation.

26. Special effort was devoted to the extension of bank culture, including the bank planting of cane, on heavy, irrigated soils, and long line irrigation.

27. The effects of various trash burning operations on production are demonstrated.

28. The work on the effects of infield transport under a system of bank culture, on yields, has been concluded and the results summarized.

29. The fertilizer practices of estates are reviewed. The consumption of fertilizers is a record brought about in part by the increased area in cane.

30. The survey of the plant food removed in mixed juice has been finished. The differences between estates in this respect are very great.

31. The foliar composition survey carried out during the year is discussed and the main conclusions presented. Phosphate is a plant food which requires increased attention on many estates. Potash requires the least attention. Dispersed blocks are discussed in relation to the nutrition of Frome's sugar cane.

32. The responses from aerially applied urea compared with conventionally applied sulphate of ammonia were disappointing.

33. For fertilizer work, little extra accuracy is to be obtained from increasing plot size beyond 4 rows $\times \frac{1}{2}$ chain, provided guard rows are used.

34. Over forty 4×4 latin squares of a half replicate 2^3 were laid out for nutrition control purposes.

35. Further evidence is presented of economic responses to $1\frac{1}{2}$ cwt. per acre muriate of potash on irrigated Agualta clays.

36. Preliminary work has been commenced on foliar fertilizing of sugar cane stubble.

37. Trials were laid out to examine the savings, if any, to be made from using mixed fertilizers.

38. The effects of pre-harvest foliar sprays on cane quality were examined. The results though of little or no significance suggest that mono-potassium phosphate may have slight beneficial effects.

39. Demonstration plots were laid down (and supervised) amongst the small farmers of Upper Clarendon to show the effects of proper cultural practices, including soil conservation, fertilizers and modern varieties upon the production of sugar cane. The extension responses obtained were very heartening.

40. Factory and distillery reports were received, checked and circulated to sugar estates during the year. The data are presented in summary form in the Appendix to this Report.

B. PRODUCTION

For the first time in the history of Jamaica, sugar production topped the 400,000 tons mark, the actual production was 418,342 tons commercial sugar. This was achieved in spite of poor juice quality, which was worse even than 1959—a poor juice year—by about 0·25 tons cane per ton sugar. It meant that a record quantity of cane was processed, the amount exceeding the 1959 high by 509,358 tons. Purchased cane accounted for 43% of the total, which compares with the figure of 44% for the previous year.

Estates' production kept pace with that of the farmers partly by reason of an increase in acreage, which totalled nearly 7% more than was reaped in 1959. The main contributors to this were Bernard Lodge, Caymanas, Frome, Innswood, Monymusk, New Yarmouth, Serge Island and Sevens. Some estates, however, due to unfavourable conditions, were forced to reap from a reduced acreage; e.g. Jamaica Sugar Estates, Hampden and Rose Hall.

Production of cane per acre attained an all-time high of 35·8 tons, and this despite the fact that only 4% of the area was in fall plants. Ten estates yielded more than 35 tons cane per acre, and only one gave lower than 30, and that by only 2·5. Sevens returned the encouraging figure of 42·1 tons per acre at an average age of 12·33 months.

The poor juice quality experienced during 1960 was partly due to a warm winter and heavier rains than normal at the start of crop, aggravated by excessive rains in June, and the longer take off of the record crop. It required 10·13 tons of cane to make a ton of 96° sugar, and nearly all estates suffered, the notable exception being Worthy Park, which ground 7·89 tons of cane for every ton of 96° sugar produced, compared with 8·30 tons for the 1959 crop.

The average production of sugar per acre was 3·77 tons, which is greater than the average for each of the two preceding years, and the average rate of productivity was nearly 6·0 cwt. sugar per acre per month. The latest 5-year moving average is 6·03 cwt. sugar

per acre per month (the predicted figure was 6·03). The expected figure at the end of the 1961 crop will be about 5·95.

Worthy Park produced sugar at a rate of nearly 8·0 cwt. sugar per acre per month, whilst Appleton and Sevens returned figures in excess of 7·0. Barnett, Holland and United Estates also reported creditable performances. The seasons for the forward crop have been reasonably good, and the expectation of an average productivity rate greater than 6·0 cwt. sugar per acre per month should be realized.

C, CLIMATE

The crop reaped experienced a warm winter, very similar to that experienced by the 1959 crop, with the result that adverse cane quality was to be expected during the earlier part of the season. The extent to which this proved to be so is illustrated by the data for the nought, eighth and twelfth weeks of the year at Monymusk, in Figure 1.

It is evident that the major factor affecting cane quality during the first 3 months of the 1960 crop compared with previous years, was winter minimum temperatures.

The comparison of cane quality as between Jamaica and Puerto Rico over recent years also makes an interesting comparison. This is illustrated in Figure 2.

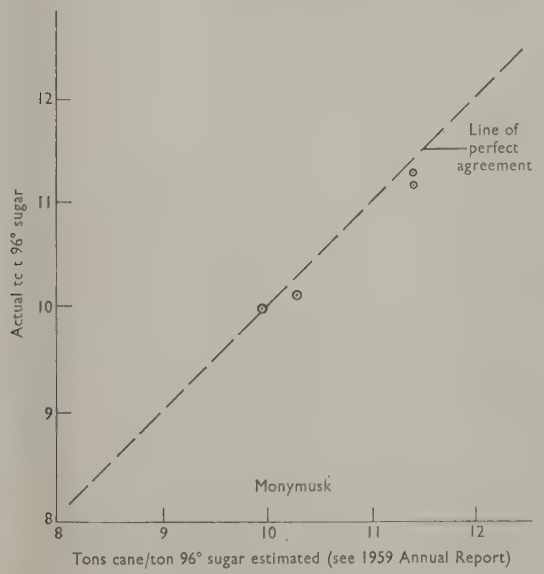


FIGURE 1

The diagram suggests that cane quality in the two countries is influenced by some strong common factor or factors, such as, for example, climate. There is little else in common between the two industries. The different average duration of cropping is probably a major cause of the dispersion of the points, especially in 1959 and 1960.

The mean monthly rainfalls and mean number of rainy days by estates are given in Tables I and II. The irrigated estates of St. Catherine and South

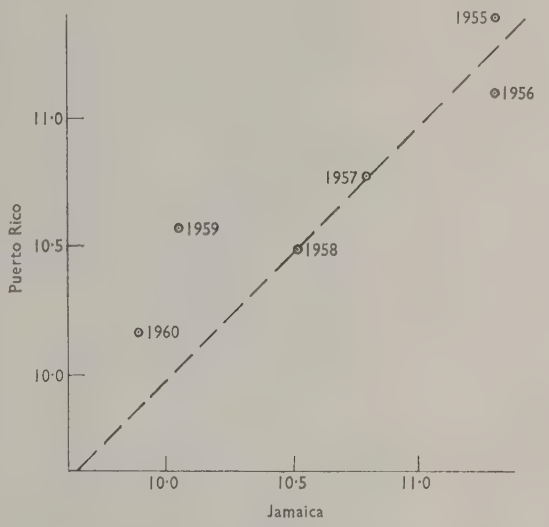


FIGURE 2

The relation between 96° sugar % Cane in Puerto Rico and Jamaica, 1955–60

Clarendon experienced a fairly dry winter and spring, with May rains delayed until June; irrigation distribution was put to a severe test, particularly during March, April and May. June rains were very excessive and interfered with reaping as well as causing some waterlogging on heavy soils. August was drier than usual but the autumn rains were heavier than average and persisted well into December, so that cane growth was better than average. The utilization of nitrogen was good and the 1961 harvest should not have been unduly influenced by unused soil nitrogen or by excessive suckering.

The wet western estates experienced a very wet "back end" to 1959 followed by a generally wet crop, which caused much infield damage from haulage and affected cane quality. Over the rest of the year rain was liberal and well distributed with a tendency to be excessive in June, July, October and November. The manner in which single row bank culture stood up to the wet harvest has been most encouraging and instructive.

The North Coast estates also experienced a wet December in 1959 and a very wet crop. With the exception of July, rain was well distributed and generally adequate during the remainder of 1960.

Richmond's very heavy December, 1959, rain was followed by the record of 22 in. in January which was associated with the excessive January rains of the Trelawny/St. James estates and Gray's Inn Central.

TABLE I

Average Rainfall—Inches

	1958												1959											1960											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Group A:																																		
Caymanas ..	2·18	1·36	1·12	0·04	17·05	4·00	1·56	3·14	3·98	15·24	3·31	0·82	0·31	0·28	0·18	2·05	5·22	0·04	0·51	0·45	1·15	5·15	4·25	3·77	2·19	0·95	1·61	2·44	1·22	17·36	3·95	4·03	6·08	11·81	3·80	3·70
Bernard Lodge ..	2·75	2·38	1·16	0·02	16·29	4·76	2·99	0·85	2·84	16·42	4·44	1·05	0·11	0·29	0·10	1·72	3·45	0·01	0·15	0·38	0·23	4·51	2·60	2·18	1·78	0·48	1·41	0·72	0·75	18·91	1·51	2·64	6·70	11·00	4·61	3·03
Innswood ..	4·82	0·88	0·84	0·30	15·96	5·74	1·70	1·00	4·00	18·59	3·37	2·79	1·65	0·44	1·12	2·88	5·58	0·10	0·02	1·51	1·70	3·93	3·72	3·54	3·46	0·50	1·45	2·35	1·40	24·15	1·08	1·04	4·40	10·30	3·38	2·09
Monymusk ..	4·40	1·35	0·52	0·15	12·25	13·20	1·01	0·93	4·11	19·58	1·78	2·04	1·15	0·66	0·66	4·79	4·75	0·07	0·06	1·64	1·72	7·03	3·62	3·76	2·48	0·95	1·10	2·01	2·54	25·48	1·30	2·25	7·68	15·26	1·88	2·00
New Yarmouth ..	6·47	1·21	1·03	nil	13·02	13·52	0·36	0·52	2·53	21·45	1·68	2·00	1·74	0·73	nil	5·58	5·48	nil	nil	1·54	0·88	7·81	4·49	5·23	1·86	2·26	2·21	2·57	3·37	28·71	3·00	2·31	10·08	17·08	3·79	2·94
Sevens	5·46	0·63	1·26	0·26	11·63	13·16	0·92	2·98	2·56	22·44	3·68	1·67	1·03	0·64	1·10	2·25	6·47	0·38	0·52	2·01	1·25	6·80	3·88	7·08	2·82	1·32	1·35	3·74	2·32	28·52	1·32	3·74	6·22	15·81	3·67	3·00
Means	4·35	1·30	0·99	0·13	14·37	8·17	1·64	1·57	3·34	18·95	3·04	1·73	1·00	0·51	0·53	3·21	5·16	0·10	0·21	1·26	1·66	5·87	3·76	4·26	2·43	1·08	1·52	2·31	1·93	23·86	2·03	2·67	8·23	13·54	3·52	2·79
70-Year Means ..	1·53	1·47	1·90	2·58	5·73	4·79	2·15	4·44	5·54	8·72	4·99	1·79	1·53	1·47	1·90	2·58	5·73	4·79	2·15	4·44	5·54	8·72	4·99	1·79	1·53	1·47	1·90	2·58	5·73	4·79	2·15	4·44	5·54	8·72	4·99	1·79
Group B:																																		
Appleton.. ..	4·83	0·62	1·94	2·91	11·37	13·33	2·93	16·11	14·56	15·28	2·22	3·73	0·62	2·17	5·68	11·87	14·83	3·51	7·42	5·36	10·35	5·18	14·43	4·46	5·91	1·11	3·72	12·08	8·76	10·13	9·51	5·24	5·93	10·54	12·03	3·22
Holland	3·65	0·31	0·22	2·34	13·79	9·16	7·07	15·44	11·17	17·74	6·44	2·15	0·54	2·19	3·54	8·62	7·33	0·72	10·66	6·40	5·43	4·75	11·28	3·90	3·88	1·10	4·03	6·05	9·23	13·78	16·56	7·08	12·14	8·94	9·24	2·57
Frome	4·25	0·42	0·86	2·31	9·44	12·14	7·86	13·03	10·14	12·52	2·93	3·68	2·66	0·77	3·02	11·70	15·48	5·31	14·59	8·74	4·86	5·53	3·00	5·25	2·30	2·87	3·21	8·17	11·17	14·76	7·40	9·26	7·41	10·60	11·26	0·71
Means	4·24	0·45	1·01	2·19	11·53	11·54	5·95	14·86	11·96	15·18	3·86	3·19	1·27	1·71	4·08	10·73	12·55	3·18	10·89	6·83	6·88	5·15	9·57	6·81	4·03	1·69	3·65	8·77	9·72	12·89	11·16	7·19	8·49	10·03	10·84	2·17
70-Year Means ..	2·18	3·17	4·67	8·08	12·22	7·64	7·26	9·73	9·41	12·27	5·63	2·59	2·18	3·17	4·67	8·08	12·22	7·64	7·26	9·73	9·41	12·27	5·63	2·59	2·18	3·17	4·67	8·08	12·22	7·64	7·26	9·73	9·41	12·27	5·63	2·59
Group C:																																		
Barnett	9·01	0·28	0·46	0·65	8·91	9·82	2·64	4·07	6·69	11·29	2·04	7·32	7·69	0·94	1·87	1·79	7·03	4·54	3·28	3·25	6·85	8·66	4·25	5·09	10·21	3·59	5·79	11·79	9·97	18·53	2·68	6·12	7·70	6·71	4·84	3·14
Rose Hall ..	12·17	1·38	0·36	0·27	2·95	11·10	0·14	2·07	2·92	10·22	1·46	6·19	4·91	1·90	0·85	5·94	4·08	1·59	0·74	1·80	1·88	5·28	1·44	6·06	12·24	3·06	6·47	2·81	3·03	7·58	0·89	–	–	–	–	–
Hampden ..	2·36	0·52	2·55	0·51	10·36	7·52	0·95	3·01	2·13	14·10	3·00	6·20	7·39	1·27	0·56	6·49	7·57	2·76	3·74	2·82	3·73	4·42	2·18	9·71	12·70	3·57	6·24	8·45	7·83	10·00	2·70	1·67	5·39	7·56	5·56	3·38
Long Pond ..	5·52	0·95	0·71	0·31	7·15	7·01	1·89	1·64	2·13	11·81	3·30	6·32	6·67	1·83	1·33	5·26	5·31	0·97	3·01	2·81	5·55	5·60	2·81	6·08	10·69	1·91	3·70	4·92	5·27	6·82	2·15	4·25	2·40	6·08	5·24	3·11
Vale Royal ..	6·47	1·60	0·66	0·13	8·00	6·33	2·28	1·65	2·05	8·92	3·64	6·75	6·96	1·36	0·84	6·57	5·85	0·83	2·28	2·58	4·70	4·95	2·59	7·65	11·72	1·87	3·40	5·77	5·71	5·21	2·14	2·95	3·07	4·47	6·11	5·30
Means	7·11	0·95	0·95	0·37	7·47	8·36	1·58	2·49	3·18	11·27	2·64	6·56	6·72	1·46	1·09	5·21	5·97	2·14	2·61	2·65	4·54	5·78	2·65	6·92	11·51	2·80	5·12	6·75	6·36	9·63	2·11	3·75	4·64	6·21	5·44	3·73
70-Year Means ..	3·62	2·15	1·91	2·66	6·44	4·52	2·71	4·19	5·12	6·72	5·76	5·43	3·62	2·15	1·91	2·66	6·44	4·52	2·71	4·19	5·12	6·72	5·76	5·43	3·62	2·15	1·91	2·66	6·44	4·52	2·71	4·19	5·12	6·72	5·76	5·43
Group D:																																		
Rich./Llndy. ..	9·02	2·38	3·30	0·22	10·93	7·22	2·27	0·82	3·28	11·61	7·67	7·95	3·42	2·36	1·24	7·06	6·04	0·07	2·10	2·68	2·71	1·71	1·47	19·68	21·69	2·62	3·32	7·96	3·33	6·21	2·00	2·62	3·72	1·91	19·46	6·98
70-Year Means ..	5·69	4·06	2·88	3·69	6·18	4·06	2·06	2·97	3·71	6·87	9·39	7·46	5·69	4·06	2·88	3·69	6·18	4·06	2·06	2·97	3·71	6·87	9·39	7·46	5·69	4·06	2·88	3·69	6·18	4·06	2·06	2·97	3·71	6·87	9·39	7·46
Group E:																																		
Gray's Inn C. ..	8·25	5·15	7·79	0·74	21·70	11·75	4·59	0·09	2·47	17·25	5·68	5·03	4·94	1·04	1·71	11·31	9·28	nil	2·69	0·57	5·56	5·02	4·40	10·20	14·05	4·39	7·26	7·35	2·51	8·12	3·74	0·56	3·58	3·04	18·40	16·67
10 or 12 Year means	5·52	6·88	3·50	3·87	6·66	3·98	3·61	2·45	4·68	7·54	8·38	10·23	5·52	6·88	3·50	3·87	6·66	3·98	3·61	2·45	4·68	7·54	8·38	10·23	6·48	6·06	3·74	3·68	6·90	4·41	3·56	2·13	4·60	7·20	8·95	10·01
Group F:																																		
Jam. Sug. Ests. ..	8·02	2·07	0·77	0·80	23·76	15·31	5·41	2·82	8·93	12·09	12·90	5·55	4·74	2·31	1·67	5·63	8·64	1·08	3·49	1·00	2·42	14·84	8·50	7·68	7·51	1·47	3·17	8·96	8·86	23·02	4·61	4·00	7·62	9·39	13·95	6·21
Serge Island ..	8·43	1·57	1·28	0·44	35·10	16·29	7·13	3·91	5·98	18·00	9·20	3·15	1·70	1·28	1·90	5·69	9·91	0·96	4·44	2·43	2·49	19·83	4·11	4·06	2·02	1·31	1·31	2·31	7·09	30·45	5·60	10·98	14·10	20·58	2·43	5·36
Means	8·23	1·82	1·03	0·62	29·43	15·80	6·27	3·37	7·46	15·05	11·05	4·35	3·22	1·79	1·79	5·66	9·28	1·02	3·97	1·72	2·46	17·34	6·31	5·87	4·77	1·39	2·24	5·64	7·98	26·74	5·11	7·49	10·86	14·99	8·19	5·78
10 or 12 Year Means	2·80	4·04	2·02	3·38	11·81	8·19	6·69	7·35	10·71	15·07	6·70	4·88	2·80	4·04	2·02	3·38	11·81	8·19	6·69	7·35	10·71	15·07	6·70	4·88	3·25	3·42	1·86	3·29	11·88	10·11	6·88	7·67	11·49	14·49	7·11	5·29
Group G:																																		
United Estates ..	3·95	1·11	2·73	0·84	12·63	7·84	6·33	6·83	5·97	20·58	4·07	3·91	1·37	1·05	1·04	6·39	6·54	2·11	3·94	5·09	3·23	4·92	3·77	8·83	5·06	0·73	3·73	6·99	3·90	18·36	4·64	5·82	5·78	8·00	6·78	2·86
Worthy Park ..	5·78	2·57	2·45	0·14	9·98	11·26	6·21	6·35	6·01	23·79	2·70	5·32	0·98	1·09	1·06	3·81	7·71	2·92	2·94	3·91	4·97	11·67	5·81	10·62	2·19	0·76	3·02	8·27	5·23	21·20	3·91	5·94	7·61	9·54	5·31	3·95
Means	4·86	1·84	2·59	0·49	11·30	9·55	6·27	6·59	5·99	22·18	3·39	4·62	1·18	1·07	1·05	5·10	7·13	2·52	3·44	4·50	4·10	8·30	4·79	9·73	3·63	0·75	3·38	7·63	4·57	19·78	4·28	5·88	6·70	8·77	6·05	3·41
70-Year Means ..	2·47	2·04	2·62	3·96	8·11	7·26	5·03	6·59	7·16	9·70	6·22	2·88	2·47	2·04	2·62	23·96	8·11	7·26	5·03	6·59	7·16	9·70	6·22	2·88	2·47	2·04	2·62	3·96	8·11	7·26	5·03	6·59	7·16	9·70	6·22	2·88

TABLE II

Number of Days in each Month on which Average Precipitation Exceeded 0·5 Inches

	1958												1959												1960											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Group A:																																				
Caymanas ..	1	1	1	–	8	3	1	2	2	9	2	–	–	–	–	–	4	–	–	–	1	1	5	2	–	1	2	2	–	9	1	3	4	9	2	3
Bernard Lodge	3	2	1	–	5	5	1	–	3	7	3	1	–	–	–	1	2	–	–	–	–	–	3	1	1	–	1	–	–	7	1	1	4	5	4	2
Innswood ..	3	–	1	–	7	6	1	–	3	8	2	2	–	–	–	3	3	–	–	1	2	2	3	2	3	–	1	1	1	6	–	–	2	7	1	–
Monymusk ..	2	1	–	–	5	7	–	–	2	3	–	2	1	1	–	2	2	–	–	2	1	3	1	2	2	1	1	1	1	8	–	2	2	8	1	2
New Yarmouth	4	1	1	–	7	8	–	–	1	4	1	1	2	–	–	2	2	–	–	2	1	1	4	4	2	2	2	1	3	9	3	2	5	9	5	2
Sevens ..	4	–	1	–	8	9	–	1	1	6	2	1	–	–	1	1	2	–	–	1	–	–	3	4	2	1	–	2	1	10	–	1	4	9	–	1
Group B:																																				
Appleton ..	2	–	1	2	10	7	1	8	11	9	1	3	–	2	5	8	8	3	5	3	10	5	7	4	3	1	4	11	4	5	9	3	4	6	9	3
Holland ..	2	–	–	1	7	7	5	13	7	6	5	–	–	2	4	4	6	–	9	5	4	3	8	3	2	–	4	4	5	7	10	5	8	5	7	
Frome ..	3	–	–	1	5	7	5	9	6	6	2	3	3	–	1	10	12	2	14	6	4	2	–	4	1	2	2	6	8	6	4	6	4	9	9	
Group C:																																				
Barnett ..	4	–	–	–	6	5	1	3	3	5	1	4	4	–	1	1	5	3	4	3	5	6	4	3	4	1	1	8	5	8	2	5	6	3	1	1
Rose Hall ..	9	1	–	–	1	6	–	2	1	6	–	4	3	2	–	4	2	1	–	2	2	3	1	2	4	2	5	2	3	4	–	–	–	–	–	–
Hampden ..	4	1	1	1	5	5	–	1	1	10	2	3	2	1	–	5	4	1	3	3	3	4	1	4	5	1	3	5	3	5	2	1	3	4	4	1
Long Pond ..	4	1	1	–	3	3	1	1	–	7	1	3	2	1	1	3	2	–	2	1	4	2	1	3	6	2	3	4	3	4	1	1	–	7	3	1
Vale Royal ..	4	–	1	–	2	4	1	–	–	6	2	5	3	–	–	3	2	–	–	1	4	4	1	6	4	2	2	5	4	5	1	1	2	4	3	3
Group D:																																				
Richmond/ Llandovery ..	5	3	2	–	8	4	–	–	3	8	5	4	3	1	–	3	2	–	–	1	2	1	–	5	8	2	1	4	2	5	2	1	3	1	15	3
Group E:																																				
Gray's Inn C. ..	5	1	2	1	9	8	3	–	1	9	2	2	3	–	1	6	4	–	1	–	4	2	4	3	9	2	4	6	1	6	1	–	1	3	10	9
Group F:																																				
Jam. Sug. Ests.	2	1	–	–	8	9	2	–	5	7	5	4	1	1	–	3	5	–	–	–	1	5	5	5	3	–	2	5	3	7	3	2	6	5	8	3
Serge Island ..	6	1	1	–	10	14	7	3	5	5	6	–	–	1	–	4	5	–	3	–	2	5	3	3	1	1	–	1	4	11	5	3	7	9	1	3
Group G:																																				
United Estates	2	–	2	–	10	5	1	2	–	9	2	3	–	–	–	2	2	–	2	1	–	3	2	6	4	–	2	5	1	9	3	5	4	5	4	1
Worthy Park ..	3	1	3	–	8	6	3	4	6	6	2	4	–	–	–	3	5	2	–	2	3	6	5	6	1	–	3	6	2	11	2	4	4	7	4	3

During the remainder of the year Richmond rains were very variable but with a great excess of rain in November.

Gray's Inn Central experienced a very wet crop, at no time were rainfall deficits sufficient to have had any beneficial effect on cane quality and sucrose % cane suffered accordingly. The succeeding crop was adversely affected by deficient rainfalls in the period July-September inclusive, whilst excessively heavy rainfalls were experienced in November and December, leading to adverse juice quality to be expected early in the 1961 crop.

The wet eastern group of estates, after having a wet "back end" to 1959, which continued in January for Jamaica Sugar Estates, had good April rains followed by extreme rainfalls in June, which badly affected reaping, and in the case of Jamaica Sugar Estates sufficiently to permit adequate shatter usually associated with good land preparation. It is not unlikely that when conditions are not ideal, deep cultivation is ineffective. Complex experiments involving 96 to 128 plots each were designed to compare:—

(*a*) shallow *v.* deep cultivation,

(*b*) coarse *v.* fine tilth,

(*c*) combination of (*a*) and (*b*).

Four such experiments were reaped at United Estates—Southern St. Catherine (2), Innswood and Sevens. Rainfall records show that these were subject to varying quantities of rainfall prior to land preparation, as can be seen from Table III below.

The figures show that conditions for cultivation were ideal at Smallwood 13 only but much more favourable

TABLE III

Rainfall for 4 Weeks and Soil Moisture Prior to Start of Cultivation Operations

Rainfall or soil moisture	Site			
	United Estates Smallwood 13	United Estates Smallwood 7	Sevens Parnassus 66	Innswood Gladstone 3
Rainfall during operations.. ..	0·09 in.	0·30 in.	0·40 in.	Nil
1 week prior to start of cultivation operations	Nil	0·80 in.	0·24 in.	0·28 in.
2 weeks prior to start of cultivation operations	0·06 in.	0·06 in.	Nil	Nil
3 weeks prior to start of cultivation operations	0·28 in.	1·41 in.	0·83 in.	0·77 in.
4 weeks prior to start of cultivation operations	0·28 in.	0·08 in.	Nil	0·11 in.
Soil moisture % 0 to 6 in. ..	12·5	not taken	43·2	28·0
6 to 12 in. ..	17·0		43·2	28·5
12 to 18 in. ..	20·0		41·6	28·5
18 to 24 in. ..	33·0		42·8	32·0

caused heavy flooding and the burying of fields under layers of debris and alluvium. The behaviour of B37172 after such treatment was excellent, and enabled large areas to be carried over to the 1961 crop without undue rotting or loss of stools. The rainfall for the 1961 crop was excessive and, indeed, harmful.

Following a wet December in 1959, United Estates registered a wet January and cane quality was affected by a wet harvest. Worthy Park fared better early in crop but had an abnormally heavy April rainfall. For the 1961 crop the rainfall at both Worthy Park and United Estates was regular and well distributed. The heavy June rains damaged the 1960 crop on both estates and particularly on the heavier soils of United Estates.

D. CULTIVATION

Land preparation prior to planting

Investigations initiated in the spring of 1959 to indicate the optimum depth of cultivation and fineness of tilth produced preliminary results during the 1960 crop. These studies are being conducted on marine clays of irrigated areas where the texture of the soil is such that its sub-surface region hardly ever dries at Gladstone 3 than at Parnassus 66. Very little rain had fallen up to 4 weeks prior to the commencement of tillage operations, and a negligible quantity fell in the week during which land preparation was carried out. Weather conditions were reasonably favourable at Innswood, but the burning of trash after the harvest was poor, and limited the depth of penetration of the Rome harrow to only about 6 in. The land was too wet at Smallwood 7 and Parnassus 66 to allow of proper cleavage of the clay clods, but the disc harrow cut to an appreciably greater depth than in dry conditions. One disc ploughing also was carried out to a depth of 12 in. throughout the experiment area at Parnassus. The difference in effect of sub-soiling was most noticeable, depending on the moisture status of the soil, shattering being pronounced at Smallwood 13 and Innswood where the sub-soil was not too wet, whereas at Smallwood 7 and Parnassus 66 the knifer effected only a slicing action. Plant crop results are most interesting and are presented in Table IV.

At Smallwood 13 and Gladstone 3 where moisture conditions for sub-soil cultivation were reasonably favourable, significant responses (of the order of more than 5 TC/A) were obtained to two knifings. It should

be explained that one knifing at least was necessary at Smallwood 13, as the area was being newly planted to cane from scrub bush, and large roots had to be removed from the sub-soil. On the same field six passes of the disc harrow was no more beneficial than three passes, whilst at Innswood, four passes tended to give increased yields over two passes, suggesting that the optimum number was probably three to four.

Under the wetter conditions of Smallwood 7 and Parnassus 66 more passes of the disc harrow gave some evidence of better results when no knifing was carried out. This effect was nullified in the presence of knifing, but harrowing six times alone was as effective as any other treatment.

investigated. Two factors, among others, are worthy of consideration:—

(*a*) at what tonnage of cane per acre and at what ratoons should replanting be done, and

(*b*) whether ratoons can be resuscitated so that replanting may be postponed.

Most estates have assumed a critical tonnage per acre below which fields are replanted, irrespective of cycle. A more accurate assessment would be obtained if the profits per acre per annum could be derived, based on the average yields expected from different cycles. It is suggested that a good estimate of the situation might be arrived at by calculating the cost

TABLE IV

Tons Cane per Acre for Cultivation Treatments

(H = Harrowing. K = Sub-soil knifing)

	3 H	6 H	Mean	
Smallwood 13:				
1 K	46·1	46·1	46·1	
3 K	53·2	50·5	51·8	
Mean	49·7	48·3		S.E. % g.m. 21·5
Smallwood 7:				
0 K	41·0	45·5	43·2	
2 K	43·3	44·2	43·8	
Mean	42·2	44·8		S.E. % g.m. 23·0
	2 H	4 H	Mean	
Parnassus 66:				
Disc ploughed throughout { 0 K	50·5	52·1	51·3	
2 K	52·8	50·4	51·6	
Mean	51·6	51·3		S.E. % g.m. 8·8
Gladstone 3:				
0 K	36·2	39·3	37·7	
2 K	44·1	46·4	45·2	
Mean	40·1	42·8		S.E. % g.m. 13·3

The above queries the value of deep cultivation under wet heavy clay conditions and suggests that under such conditions the higher numbers of disc harrowings gave as good a tilth as any other treatment. When the soil is dry there is little doubt that tillage down to 20 in. was beneficial, and it would appear that in this situation three to four harrowings and two to three knifings should be practised.

up to reaping, including overheads, of plants and subsequent ratoons, subtracting this from the value of the cane in the field and obtaining an estimate of the profit per acre per annum. The profit will rise from plants through successive ratoons, attain a maximum and then decline. It is after the maximum has been passed that replanting should be effected. Schematically the calculations would be as follows:—

	Plants	1st ratoons	2nd ratoons	3rd ratoons	4th ratoons	5th ratoons	6th ratoons
Cost up to reaping, including overheads	x	y	y	y	y	y	y
Value of cane in field based on expected average yield and juice quality ..	a	b	c	d	e	f	g
Profit	$(a-x)$	$(b-y)$	$(c-y)$	$(d-y)$	$(e-y)$	$(f-y)$	$(g-y)$
Average profit per crop	$(a-x)$	$\frac{(a+b)-(x+y)}{2}$		$\frac{(a+b+c)-(x+2y)}{3}$, etc. $= P$			

Ratooning

Replanting is one of the most expensive operations in the sugar industry, and the economics of how long ratooning should be continued have not been thoroughly

When P starts to decrease will be the optimum economic time for replanting.

Declining ratoon yields are caused largely by loss of tilth and reduction in plant population. The latter

can be remedied to some extent by replacing dead stools; proper ratoon cultivation may ameliorate the former. Field trials have been initiated at Monymusk, Innswood and Worthy Park and will be extended to other estates, to compare:—

(*a*) Continued ratooning with no cultivation.

(*b*) Trash burnt, inter-row knifing, followed by moulding up.

(*c*) Trash burnt, cultivating the bank by a knife down to 10 in. behind a rolling coulter, inter-row knifing and subsequent moulding up.

(*d*) Replanting.

Irrigation

Traditionally surface irrigation is carried out in Jamaica by leading water into furrows from channels placed ½ chain apart. Experimental evidence obtained 5 years ago suggested that plant cane yields were not affected and less water was required when irrigation lines were extended to 5 chains, but that there was a slight falling off of ratoon yields, probably due to uneven trash distribution in the furrows. There is also in existence similar evidence obtained by Mr. H. A. Thompson at Monymusk. This subject is being investigated on a wider scale, and field trials have been laid out at Monymusk, Bernard Lodge, Innswood, Sevens and Caymanas.

The Southern St. Catherine and Clarendon irrigated estates are particularly fortunate in that the majority of this land has a very uniform natural slope, less than 1%. The work was designed to measure optimum stream sizes with respect to length of furrow, erosion, soil water uptake, the time required to irrigate unit areas and the general efficiency of irrigation, and to awaken generally irrigated sugar estates to the possibilities of the system. With the prospect of mechanization of loading, and perhaps reaping, becoming greater, the smooth infield movement of equipment, including trains of three to five cane carts, assumes the greatest importance, so that the elimination of infield mains and twigs is becoming highly desirable for reasons in addition to their cost of digging and maintenance.

Germination was generally good and growth measurements carried out by the Monymusk and Bernard Lodge staffs along the length of the irrigation furrows showed that for the plant crop, growth rates were not affected by distance from the start of the line. Rainfall distribution and precipitation were, however, reasonably good throughout the year, and may have masked any differences that would otherwise have occurred. Nevertheless, the plant crop yields of one trial at Innswood reaped in 1960 suggest that there was a loss of only 1 ton of cane per acre from irrigating in 10 chain lines compared with irrigating ½ chain lines. The uniformity of water distribution was confirmed by gypsum resistance blocks and a considerable saving in water was effected.

We are indebted to the officers of the Ministry of Agriculture and Lands for their co-operation and help in layouts and in metering the water and certain timing studies on Caymanas, Bernard Lodge and Innswood. We are particularly indebted to Mr. W. Hinz of I.C.A. for his advice and to the irrigation officer at Monymusk who laid out the Monymusk trial and supervised the irrigation and the Agronomist at Bernard Lodge who did most of the detailed work there. We would suspect that, with accurate preparation of furrows and irrigation head canals, water streams can be effectively metered into furrows by the use of plastic or aluminium removable syphons, as is done in other countries.

Bank *v.* furrow planting

The irrigated sugar estates have a very high proportion of their banks in Sydenham and Agualta clays of relatively unstable structures and very slow internal drainage. If optimum management of these soils is to be achieved, culture must be based upon growing crops on a bank, and if the beneficial effects of land preparatory cultivation are to be maintained to the greatest extent in the face of having to use surface means of distributing water, the banks should be made as high as possible prior to the first irrigation. The system is expensive of water in the first and second rounds, and where water is in short supply an irrigation advantage could be obtained by lowering the height of the initial banks, but this has to be balanced against the tilth destruction influences of the irrigation water in the furrows which interferes also with the quality of the earthing operations which would follow later if low banks were first prepared. Added to this, furrows do not easily dry to any depth and at certain times, the chances of having rainfall also interfere, are great.

Work early in the 1950's at Monymusk had shown that bank culture was desirable but difficulties had been encountered on that estate in establishing bank planted cane, partly because of the non-uniform nature of land surface and the difficulty of irrigating adequately high banks. Elsewhere, at Innswood bank planting of sugar cane without further earthing became an established practice in the late 1940's and has continued ever since; likewise, it became established on United Estates' lower St. Catherine farms from the early 1950's. To help Monymusk develop a general field practice, experiments were laid out to determine the merits of the following treatments:—

(*a*) Cane planted in the centre of high (15 in.) banks.

(*b*) Cane planted in the centre of low (10 in.) banks and moulded up after 8 weeks.

(*c*) Cane planted in the centre of low (10 in.) banks and not moulded.

(*d*) Cane planted staggered on top of low (10 in.) banks and not moulded.

In addition, much attention was devoted to developing the extension of bank culture, including bank planting on this estate, on a field scale. The Autumn bank planted areas have given every sign of being a great success. Germination was excellent and growth good.

Consequences of trash burning

Investigation at Frome shows that when trash is burnt prior to replanting, slight increases in yield may

result compared with incorporating trash during land preparation operations. This gain may be largely offset by the application of extra nitrogen to the trash incorporated area. The effects continue into the first and second ratoon crops. Plots which have been burnt every crop gave small increases also over unburnt plots, but these gains became progressively smaller with successive ratooning, and in the 2nd ratoon crop, plots on which trash was incorporated prior to planting gave at least as much cane as those on which trash was burnt every year. Extra nitrogen did not produce any benefit for any crop where burning of trash was done before replanting only. Table V illustrates this.

Unfortunately, this study was made when cane was cultivated on a cambered bed system, and inter-row cultivation in ratoons—a most desirable feature when trash is burnt every crop—was difficult. If this operation could have been effectively done, ratoon yields might not have been affected. It must be remembered that continuous burning brings in its trail the necessity for extra weed control and the possibility perhaps of greater pest infestation. On the other hand, water is likely to be more uniformly distributed on surface irrigated estates, and ratoon resuscitation will be more easily practicable. During the duration of the experiment the moisture conservation properties of the trash mulch must have been very small. These results were obtained under conditions of high natural rainfall and must be interpreted with caution if to be applied elsewhere.

TABLE V

CANE YIELDS RELATIVE TO NO BURNING AND NO EXTRA NITROGEN APPLIED = 100 FOR THREE CROPS

	Trash incorporated prior to planting	Trash burnt prior to planting only	Trash burnt every crop	
Spring plants:				
Normal S/A applied	31·5	114	112	
1½ cwt. S/A per acre extra ..	107	112	109	
S.E. % g.m.				12·2
1st ratoon:				
Normal S/A applied	39·5	106	103	
1½ cwt. S/A per acre extra ..	104	105	103	
S.E. % g.m.				7·6
2nd ratoon:				
Normal S/A applied	35·3	108	95	
1½ cwt. S/A per acre extra ..	107	103	103	
S.E. % g.m.				13·7

The effect on infield transport on yields

Cane is grown on cambered beds on large areas of heavy clay soils in heavy rainfall regions. On some estates the cane is headed out to the intervals prior to loading, but on one estate in particular transport vehicles operate on one bed in every three beds, taking the produce from the bed on which it is operating as well as from the two adjacent beds. In a wet crop considerable damage is done to the beds over which the cane is drawn, so-called "draw beds." A study was initiated in 1957 on ten fields on which cattle carts were used for haulage and eight fields on which tractor carts were used, to assess:—

(*a*) the loss in yield, if any, accruing from damage to the draw beds,

(*b*) the damage, if any, along the length up to 4 chains along the draw bed, and

(*c*) the difference between drawing on the same bed every year and drawing on alternate beds.

Damage on draw beds

The yield of cane on the draw beds was compared with that on "free" beds, i.e. beds over which no transport vehicles passed. The figures are based on the yields of three ratoon crops and adjusting for the plant cane yields. The evidence suggests that draw bed yields were equal to those of free beds. It must be borne in mind, however, that when draw beds are damaged, extensive cultivation of a repair nature is carried out on them. No such operations are carried out on the free beds. It would appear from the results that whatever damage was done by transport vehicles was corrected by tillage, and the problem therefore becomes a question of how costly are the operations for resuscitating the affected beds. It should be pointed out that the crops on which the findings are based were not unduly wet.

TABLE VI

RELATIONSHIP BETWEEN DRAW BED AND FREE BED PRODUCTION BASED ON RATOON YIELDS FOR THREE CROPS ADJUSTED FOR PLANT YIELDS

	Draw bed % free bed
Tractors and trailers	99
Cattle and carts	102
Average	100

Extent of damage along the length of draw beds

Greater weight is taken over areas nearer the intervals, and hence there is every likelihood of greater damage occurring in these areas. Examination was conducted on yields of three ratoon crops adjusted for plant crop results at 1 chain spaces up to 4 chains from the intervals. The 1 chain figure for tractors and trailers is most likely overestimated as it includes the returns from one field which showed a figure for

TABLE VII

RATOON YIELDS FOR THREE CROPS ADJUSTED TO PLANT YIELDS ACCORDING TO DISTANCE FROM INTERVAL

	4 chains	3 chains	2 chains	1 chain
Tractors and trailers	87	85	84	87
Cattle and carts	94	89	89	85
Average	90	87	86	(84)

the 1 chain 30% higher than other results in the same field. If this is adjusted to a level consistent with the remainder of the field, the 1 chain figure for tractor and trailers would be 83. The results indicate that the yield progressively drops towards the interval and at 4 chains in the field is 4% greater than at 1 chain in the field along the draw beds when tractors and trailers are used for haulage; the comparable figure for cattle carts is 9%.

Effect of alternating draw beds

Cane is usually hauled along the same beds every crop, and in wet weather considerable damage is done to these beds. The merits of this system compared with a system where draw beds are rotated such that each bed is used for haulage once in three successive crops, were examined. The plant and 1st ratoon yields for both treatments should be similar, as each treatment should have suffered similar haulage effects. The differences, if any, would develop in the succeeding crops, and the results are quoted for 2nd and 3rd ratoons adjusted for the two previous crops.

Table VIII—2nd and 3rd ratoon yields adjusted for plant and 1st ratoon yields of plots on which the same bed is used for haulage compared with those on which draw beds are alternated.

TABLE VIII

ALTERNATING DRAW BED % SAME DRAW BED FOR 2ND AND 3RD RATOONS RELATIVE TO PLANT AND 1ST RATOON YIELDS

Tractors and trailers	104
Cattle and carts..	104
Average	104

Some benefit would apparently be derived if transport vehicles were used on different beds for successive crops, and the gain was similar for the two types of transport.

Although this work illustrates the importance of repairing areas of damage to cultivation by transport vehicles, the results have been largely rendered of academic interest by the changed conditions of cultivation which have taken place during the period of the experiments.

The standard of harvesting operations

Cane quality is being severely reduced on many estates by a combination of bad topping, the inclusion of suckers and the inclusion of trash. To demonstrate that the consequences are very real, the topping practices on two estates were examined—one estate (A) was judged to have topping under good control whilst the other (B) was judged to be topping too high. Samples of canes topped by cutters were further topped at the base of the last green sheath with the following results:—

	Estate A	Estate B
Number of joints removed ..	0·5	3·5
Improvement in ton cane per tons sugar	0·0	0·7

On many estates attention needs to be given to staleness, which arises partly from imperfect co-ordination of loading and transport and partly (and often to a major degree) from cutters cutting fields indiscriminately and without any system so that cane carts cannot be got immediately to much of the cut cane. To compare cane quality in future with some of the good years already passed will mean little unless former standards of cutting, cleanliness of loading and staleness can be recovered.

E. NUTRITION

The type and quantities of fertilizers applied to the 1960 crop are given in Table XXVI of Appendix I.

The total consumption of nitrogen, phosphate and potash is the highest recorded for each nutrient. This is to some degree a reflection of the increased acreage of cane grown but also to the increased use of nitrogen in Trelawny especially and to the increased use of this plant food on ratoons on the western estates and to an increase in the proportion of the area cultivated which received potash. There was also increased per acre use of potash on the ratoons of western estates and to cane generally on the northern estates, particularly in Trelawny.

The phosphate and potash drain of sugar cane

The survey commenced in 1960 was extended to include Barnett, and the position on four other estates was re-examined. The data and analyses were based upon the mixed juice weights and do not include

nutrients lost in bagasse. Details are given in the 1959 Annual Report. The results obtained were as follows:—

TABLE IX

THE MEAN CROP COMPOSITION OF MIXED JUICE AND FINAL MOLASSES

	% Mixed juice				Final molasses			
	P_2O_5		K_2O		P_2O_5		K_2O	
	1959	1960	1959	1960	1959	1960	1959	1960
Barnett	0·0288	0·0247	0·127	0·109	0·121	0·134	3·45	3·52
Bernard Lodge	—	0·0565	—	0·218	—	0·124	—	5·15
Richmond..	0·0221	0·0278	0·160	0·152	—	0·135	—	4·23
Vale Royal	0·0267	0·0217	0·139	0·126	—	0·099	—	3·00
Long Pond	0·0305	0·0288	0·102	0·087	0·108	0·177	2·38	2·60

TABLE X

THE PHOSPHATE AND POTASH DRAIN IN THE MIXED JUICE OF CERTAIN FACTORIES

Estate	Tons K_2O removed in cane (juice)	Lb. K_2O removed		Balance* lb. K_2O per acre	Tons P_2O_5 removed in cane (juice)	Lb. P_2O_5 removed		Balance* P_2O_5 per acre
		Per acre	Per ton cane			Per acre	Per ton cane	
Barnett	34·42	81	2·23	+ 3·3	7·59	17·9	0·49	−14·6
Bernard Lodge ..	347·69	160	4·86	−138·0	91·39	42·1	1·28	−42·1
Vale Royal	92·01	94	2·92	+43·7	17·46	17·8	0·55	−17·8
Long Pond	56·86	77	1·93	+56·2	19·36	26·3	0·66	−26·3
Richmond/Llandovery	82·80	102	3·30	−55·0	14·43	17·7	0·58	−15·4

* = Difference between quantity applied as fertilizer and quantity removed in mixed juice.

Bernard Lodge cane is very rich in phosphate and compares in this respect with Caymanas, Jamaica Sugar Estates and Monymusk. Its mean phosphate in juice is the highest recorded for any Jamaican factory. The potash content, whilst relatively high does not attain the values of Caymanas and especially of Monymusk. The other factories of Table IX gave mixed juice analyses similar to those of 1959. The phosphate removed per acre by Bernard Lodge estate cane (42·1 lb.) and per ton cane (1·28 lb.) are the highest Jamaican figures recorded.

The great difference between the quantity of potash applied over potash removed, per acre at Long Pond and Vale Royal, is excessive when compared with other estates. It is likely that the potash dressings on these estates could be brought into more accurate balance. It appears that the phosphate balance indicated a general state where considerably more phosphate is removed per acre than is returned as fertilizer, if the fields receiving the filter mud are excluded. If the filter mud could be spread evenly over the fields, the dressing would be the equivalent of 1 to 2 cwt. per acre of single superphosphate, while the potash drain varies between slightly more than 1 cwt. per acre of muriate of potash to, in excess of 2½ cwt.

The foliar composition survey of sugar estates

In 1959–60 inclusive, 2,700 fields were surveyed. In 1960, rainfall although uneven in its distribution was generally such that the bulk of leaf composition was not adversely affected by insufficient rains. The results have been summarized for the three years in tabular form in Table. XI. The Table is divided corresponding with the samples taken after 10 days after the advent of the autumn rains and those taken before this period.

The differences between the mean cumulative frequency curves (Figure 3) are similar to those reported last year and demonstrate how much more sensitive nitrogen and potash are to the moisture régime, or to the season in which sampling is carried out, or to both, than is the phosphate content of leaves. Even if 1·60 N % dry matter is taken as an index of adequacy during the period of good rains (and cooler weather) and 1·5 at other times, if 0·42 P_2O_5 % dry matter is taken for both periods as adequate, and 1·30 and 1·24 % K_2O respectively are accepted as adequate for K_2O, the picture revealed is far from satisfactory where some estates are concerned and it must be remembered that the standards quoted are very conservative. By reference to the above

TABLE XI

% Estate Field Samples 1958–60 Classified According to the Level of Nutrient Element Concentration in the Dry Matter of an Index Leaf

(*a*) Nitrogen % dry matter

(i) *Samples taken AFTER advent of rain*

Estate	<1·20	1·21 to 1·30	1·31 to 1·40	1·41 to 1·50	1·51 to 1·60	1·61 to 1·70	1·71 to 1·80	1·81 to 1·90	1·91 to 2·00	2·01 and over
1. Bernard Lodge	3·0	6·9	15·6	16·0	19·5	18·2	14·3	3·5	1·7	1·3
2. Caymanas	1·2	—	—	2·5	12·3	12·3	23·5	23·5	18·5	6·2
3. Gray's Inn Central	—	—	8·0	8·0	21·3	22·7	18·7	9·3	10·7	1·3
4. Hampden	—	3·9	9·4	15·6	18·9	19·5	13·3	10·9	5·5	3·1
5. Innswood	3·2	7·1	11·5	14·7	19·9	20·5	14·7	2·6	5·1	0·6
6. Long Pond	1·3	2·8	9·7	23·6	9·7	16·7	13·9	12·5	6·9	2·8
7. Monymusk	—	0·6	1·5	11·7	18·0	20·4	21·0	13·2	8·4	5·4
8. New Yarmouth	—	—	10·3	17·2	31·0	13·8	20·7	3·4	3·4	—
9. Richmond	—	0·8	5·4	7·7	13·8	17·7	21·5	18·5	13·1	1·5
10. Rose Hall	3·8	7·7	15·3	23·1	23·1	10·3	6·4	5·1	3·8	1·3
11. Sevens	1·0	—	3·0	12·9	14·9	29·7	19·8	10·9	5·9	2·0
12. Vale Royal	4·3	8·1	11·4	10·0	14·3	11·4	12·9	12·9	10·0	4·8
13. Worthy Park	0·6	5·7	8·6	11·4	16·0	21·1	14·9	9·7	4·0	8·0
14. Appleton	—	0·5	1·4	12·4	16·6	20·7	18·0	12·9	7·8	9·7
15. Barnett	4·0	5·0	10·0	13·0	18·0	18·0	9·0	9·0	9·0	4·0
16. Holland	—	2·6	2·6	5·3	15·8	19·7	23·7	18·4	9·2	2·6
17. Jamaica Sugar Estates	2·2	2·2	6·7	12·2	18·9	21·1	15·6	11·1	7·8	2·2
18. Serge Island	—	2·5	12·0	8·6	32·1	27·2	11·1	6·2	—	—
19. United Estates	0·9	1·7	8·6	17·7	23·1	19·4	12·0	10·9	4·3	1·4
Average	1·4	3·2	7·7	13·1	18·4	19·2	15·8	10·8	6·8	3·5

(ii) *Samples taken BEFORE advent of rain*

1. Bernard Lodge	6·7	10·8	19·1	19·6	17·5	13·9	7·2	3·1	0·5	1·5
2. Caymanas	0·5	0·5	5·5	11·6	15·1	16·1	16·1	14·6	10·1	10·1
3. Gray's Inn Central	9·5	14·3	33·3	26·2	4·8	4·8	4·8	2·4	—	—
4. Hampden	3·5	10·4	20·9	25·2	20·0	7·8	6·1	4·3	1·7	—
5. Innswood	6·7	13·3	19·0	11·4	10·5	6·7	15·2	11·4	2·9	2·9
6. Long Pond	4·7	8·4	18·6	19·5	20·0	7·4	10·2	4·7	3·3	3·3
7. Monymusk	0·9	2·7	10·6	14·6	15·1	16·4	16·8	9·2	7·4	6·0
8. New Yarmouth	—	1·6	21·0	46·8	19·4	9·7	1·6	—	—	—
9. Richmond	—	1·2	8·1	16·3	18·6	19·8	9·3	17·4	3·5	5·8
10. Rose Hall	—	17·4	13·0	17·4	19·6	6·5	13·0	8·7	4·3	4·3
11. Sevens	0·8	4·1	13·2	28·9	19·0	15·7	9·9	2·5	3·3	2·5
12. Vale Royal	6·3	12·7	19·0	19·0	16·5	11·4	12·7	—	2·5	—
13. Worthy Park	—	—	10·3	20·7	44·8	13·8	—	3·4	6·9	—
Average	2·5	5·7	13·9	18·1	16·7	13·4	12·6	7·6	5·1	4·3

(*b*) P_2O_5 % dry matter

(i) *Samples taken AFTER advent of rain*

Estate	<0·34	0·35 to 0·36	0·37 to 0·38	0·39 to 0·40	0·41 to 0·42	0·43 to 0·44	0·45 to 0·46	0·47 to 0·48	0·49 to 0·50	0·51 and over
1. Bernard Lodge	0·4	1·3	1·3	3·0	8·2	10·0	7·8	11·6	8·7	47·6
2. Caymanas	—	2·5	7·4	12·3	16·1	6·2	6·2	7·4	14·8	27·2
3. Gray's Inn Central	13·3	6·7	4·0	6·7	8·0	9·3	10·7	12·0	12·0	17·3
4. Hampden	14·1	6·3	10·2	7·8	13·3	10·2	4·7	14·8	2·3	16·4
5. Innswood	5·1	5·8	5·8	7·7	9·6	9·6	10·9	12·8	6·4	26·3
6. Long Pond	5·6	—	5·6	2·8	5·6	13·9	6·9	15·3	8·3	36·1
7. Monymusk	5·1	1·8	6·3	6·9	6·9	9·0	7·5	7·8	5·7	43·2
8. New Yarmouth	13·8	3·4	27·6	10·3	13·8	6·9	13·8	3·4	3·4	3·4
9. Richmond	10·0	11·5	11·5	11·5	8·5	15·4	7·7	5·4	6·2	12·3
10. Rose Hall	25·6	9·0	10·3	9·0	9·0	2·6	3·8	5·1	11·5	14·1
11. Sevens	7·9	7·9	8·9	8·9	10·9	20·8	3·0	12·9	3·0	15·8
12. Vale Royal	26·2	3·8	11·4	17·6	11·9	10·5	4·8	4·8	2·9	6·2
13. Worthy Park	15·4	5·7	8·0	10·3	12·6	3·4	7·4	2·9	3·4	30·9
14. Appleton	5·1	5·1	14·7	15·2	11·1	12·4	8·3	6·5	7·4	14·3
15. Barnett	8·0	4·0	10·0	14·0	9·0	9·0	8·0	11·0	2·0	24·0
16. Holland	22·4	13·1	23·7	15·8	5·3	7·9	6·6	1·3	2·6	1·3
17. Jamaica Sugar Estates	3·3	2·2	6·7	5·6	12·2	11·1	8·8	7·8	6·7	36·0
18. Serge Island	21·0	9·9	22·2	11·1	7·4	11·1	7·4	3·7	1·2	4·9
19. United Estates	18·9	9·1	10·9	15·4	10·9	8·9	4·0	6·0	3·7	12·3
Average	11·3	5·5	9·6	10·5	9·9	9·9	6·9	7·9	5·6	22·9

(ii) *Samples taken BEFORE advent of rain*

Estate	<0·34	0·35 to 0·36	0·37 to 0·38	0·39 to 0·40	0·41 to 0·42	0·43 to 0·44	0·45 to 0·46	0·47 to 0·48	0·49 to 0·50	0·51 and over
1. Bernard Lodge	1·0	0·5	3·6	8·3	5·7	18·7	7·3	7·8	10·4	37·4
2. Caymanas	5·5	3·5	9·6	12·1	9·6	17·1	7·5	9·6	6·5	19·1
3. Gray's Inn Central ..	26·2	14·3	14·3	2·4	—	11·9	7·1	14·3	2·4	7·1
4. Hampden	37·4	6·1	16·5	13·0	4·3	8·7	0·9	3·5	3·5	6·1
5. Innswood	23·8	9·5	3·8	9·5	5·7	1·0	4·8	7·6	5·7	28·6
6. Long Pond	5·1	1·9	7·0	6·0	8·4	7·9	11·6	15·3	10·2	26·5
7. Monymusk	6·4	2·9	6·2	6·9	4·9	8·5	4·4	7·4	7·1	45·4
8. New Yarmouth	17·7	3·2	19·4	11·3	1·6	11·3	11·3	9·7	8·1	6·5
9. Richmond	17·4	—	14·0	17·4	12·8	16·3	2·3	9·3	2·3	8·1
10. Rose Hall	36·9	8·7	15·2	8·7	13·0	6·5	2·2	2·2	2·2	4·3
11. Sevens	11·6	7·4	9·1	14·9	15·7	6·6	6·6	8·3	9·9	9·9
12. Vale Royal	44·3	12·7	13·9	10·1	1·3	6·3	1·3	5·1	2·5	2·5
13. Worthy Park	37·9	10·3	13·8	10·3	6·9	6·9	6·9	3·4	3·4	—
Average	12·3	4·1	8·4	9·1	6·7	10·0	5·7	8·3	6·9	28·3

(*c*) K_2O % dry matter

(i) *Samples taken AFTER advent of rain*

Estate	<0·90	0·91 to 1·00	1·01 to 1·10	1·11 to 1·20	1·21 to 1·30	1·31 to 1·40	1·41 to 1·50	1·51 to 1·60	1·61 to 1·70	1·71 and over
1. Bernard Lodge	—	—	0·4	3·0	3·0	6·5	12·6	16·5	15·6	42·4
2. Caymanas	1·2	—	1·2	3·7	4·9	6·2	8·6	19·8	19·8	34·6
3. Gray's Inn Central ..	—	—	—	2·7	6·7	9·3	22·7	26·6	13·3	18·7
4. Hampden	—	0·8	2·3	5·5	15·6	25·8	18·8	17·2	7·0	7·0
5. Innswood	3·8	2·6	7·7	9·0	9·0	8·3	17·9	16·0	11·5	14·1
6. Long Pond	—	1·4	—	5·6	4·2	8·3	11·1	9·7	13·9	45·8
7. Monymusk	3·9	5·7	13·5	16·8	15·0	13·8	12·3	6·9	3·3	9·0
8. New Yarmouth	6·9	10·3	10·3	—	6·9	—	17·2	3·4	17·2	27·6
9. Richmond	2·3	6·2	19·2	19·2	13·8	13·8	6·9	7·7	5·4	5·4
10. Rose Hall	1·3	—	5·1	11·5	14·1	17·9	7·7	11·5	6·4	24·4
11. Sevens	5·0	1·0	3·0	7·9	4·0	7·9	9·9	13·9	5·9	41·6
12. Vale Royal	4·3	1·0	1·9	8·1	11·0	12·9	15·2	13·3	9·0	23·3
13. Worthy Park	—	—	—	1·1	9·7	10·9	15·4	17·7	16·6	28·6
14. Appleton	—	1·4	6·0	8·8	23·5	26·7	18·9	7·4	5·5	1·8
15. Barnett	3·0	3·0	9·0	10·0	13·0	25·0	21·0	10·0	3·0	2·0
16. Holland	—	5·3	5·3	7·9	10·5	10·5	11·8	11·8	26·3	10·5
17. Jamaica Sugar Estates ..	1·1	4·4	15·6	14·4	30·0	11·1	13·3	4·4	3·3	2·2
18. Serge Island	—	1·2	1·2	4·9	7·4	17·3	24·7	22·2	8·6	12·3
19. United Estates	1·1	2·6	8·3	12·0	17·4	15·1	19·7	11·1	5·7	6·9
Average	1·8	2·3	6·3	9·1	12·7	14·0	15·3	12·5	9·1	16·9

(ii) *Samples taken BEFORE advent of rain*

1. Bernard Lodge	—	—	1·5	1·5	3·6	7·1	13·9	14·4	16·0	41·2
2. Caymanas	2·5	2·5	5·5	7·5	6·5	10·1	11·1	16·6	14·6	23·1
3. Gray's Inn Central ..	—	—	2·4	2·4	2·4	14·3	4·8	15·3	19·0	40·5
4. Hampden	—	—	—	3·5	10·4	17·4	22·6	12·2	14·8	19·1
5. Innswood	11·4	9·5	10·5	17·1	16·2	13·3	9·5	7·6	1·9	2·9
6. Long Pond	1·4	0·9	0·5	7·0	6·5	6·5	13·5	14·4	11·2	38·1
7. Monymusk	10·6	11·5	9·0	14·5	12·3	9·7	10·4	7·9	4·5	9·5
8. New Yarmouth	—	—	1·6	6·3	4·8	12·7	27·0	13·7	11·1	23·8
9. Richmond	2·3	4·7	9·3	16·3	16·3	19·8	19·8	4·7	3·5	3·5
10. Rose Hall	—	—	—	2·2	6·5	10·9	15·2	21·7	17·4	26·1
11. Sevens	0·8	7·4	7·4	7·4	15·7	5·8	9·9	16·5	9·1	19·8
12. Vale Royal	—	—	1·3	2·5	12·7	11·4	16·5	17·7	11·4	26·6
13. Worthy Park	—	—	—	6·9	13·8	13·8	31·0	10·3	20·7	—	3·4
Average	5·1	5·8	5·7	9·9	10·2	10·6	12·8	11·8	8·9	19·3

standards and the frequency with which estates' fields have fallen above these limits over the last three years, one arrives at the general classification given below:—

A Little importance and probably fairly satisfactory	B Medium importance	C Great importance
(*a*) *Nitrogen* Appleton, Caymanas, Holland, Richmond, Long Pond, Monymusk	Barnett, Jamaica Sugar Estates, Worthy Park, United Estates, Vale Royal, Sevens	Gray's Inn Central, Bernard Lodge, Rose Hall, Innswood, Hampden, Serge Island, New Yarmouth
(*b*) *Phosphate* Bernard Lodge, Monymusk, Long Pond, Jamaica Sugar Estates	Innswood, Appleton, Barnett, Caymanas, Gray's Inn Central, Sevens	Hampden, Holland, New Yarmouth, Richmond, Rose Hall, Serge Island, United Estates, Vale Royal, Worthy Park
(*c*) *Potash* Bernard Lodge, Caymanas, Gray's Inn Central, Hampden, Holland, Long Pond, New Yarmouth, Rose Hall, Vale Royal, Worthy Park	Appleton, Barnett, United Estates, Innswood, Monymusk, Richmond, Sevens Serge Island	Jamaica Sugar Estates

changes in cane culture; whilst Jamaica Sugar Estates' response curves from numerous experiments suggest strongly that current nitrogen applications are too conservative. This also is an estate which should examine on a commercial scale the effects of increasing their nitrogen dressings.

By comparison with Monymusk, Caymanas, Sevens and Innswood, New Yarmouth could probably with advantage increase their nitrogen application and this should be explored commercially. Hampden should definitely increase their fertilizer expenditure on nitrogen, especially in their heavier rainfall areas and overhead irrigated lands. Rose Hall's low nitrogen uptake results in part from volatilization of ammonia to the air from their highly calcareous, alkaline soils. The sub-surface application of sulphate of ammonia should be developed wherever possible. Serge Island's nitrogen nutrition suffers probably for two reasons. Nitrogen dressings could probably be increased to nearer 90 lb. per acre, but also, on their very coarse alluvial soils, split dressings are desirable, i.e. part of the nitrogen should be withheld each year until the crop has put

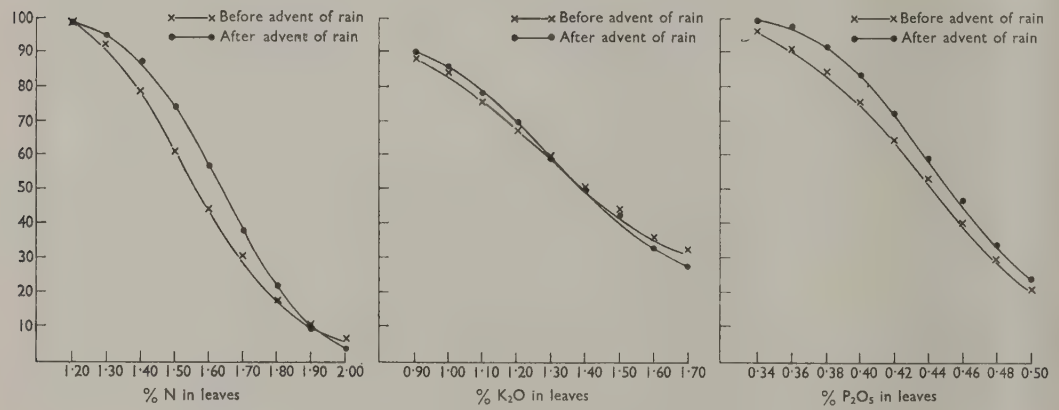


FIGURE 3

Cumulative frequency curves for N, K_2O, P_2O_5

Paired plots distributed over Barnett have shown that nitrogen rates can be increased. If this is put into effect commercially, Barnett should be expected to move into Group A for this element. Worthy Park's paired plots have also shown that small increases are to be obtained from increasing nitrogen dressings. Long Pond in recent years has practised heavier nitrogen dressings than Vale Royal and now that Vale Royal's potash status is adequate some transfer of expenditure from potash to nitrogen is warranted. On the irrigated lands of United Estates it would probably be advisable to increase nitrogen by about 1 cwt. sulphate of ammonia per acre and this would be worth examining commercially. The nitrogen status of Seven's irrigated cane will probably improve with out a well developed new root system. The apparently unsatisfactory nitrogen uptake at Innswood and Bernard Lodge requires further study.

The phosphate status is interesting. Hampden, Holland and Vale Royal especially require to bring up the phosphate status of their cane; Vale Royal particularly at Swanswick, Barnstable and Arcadia. There are areas of Richmond also which require particular attention. Although the phosphate status at Worthy Park appears inadequate, field responses on many fields have been disappointing. The problem of placement requires particular investigation at Worthy Park, Innswood and Serge Island. On the last estate, the terrace fields and the hillsides are the main phosphate deficient areas. Gray's Inn should also examine

commercially the application of superphosphate on their fairly numerous fields of low phosphate uptake, particlarly at Gibraltar and Dover. We suspect that on many estates infield transport damage to tilth, particularly during the 1960 crop may have resulted in a very significant reduction in root systems with consequent limitation of phosphate uptake.

Generally, the potash status of sugar cane is better than either the phosphate or nitrogen status. Appleton, Barnett and United Estates pursue a fertilizer policy which should improve their position in the relatively near future. At Monymusk the slow internal drainage of large areas of their heavy clay soils has limited uptake, but with their current change to bank culture, the uptake of potash during the boom period and earlier, should improve. Soil structure is a factor at Innswood also but Innswood's soils are inherently poorer in potash than the Monymusk soils. Potash applications will probably need to be increased at Richmond, particularly on much of the very stony calcareous soils brought into sugar cane production recently. The potash dressing at Long Pond, Vale Royal and probably New Yarmouth, could be decreased.

The different mean fertilizer policies pursued by the different estates for the 1960–61 crop are given in Table XII.

During the year, large field plots were distributed over Barnett and Worthy Park to which fertilizer dressings over and above the standard practices for each field, were made. They proved of great value in reviewing the current commercial nutritional practices. Such plots can be laid out in such a way that they do not interfere unduly with reaping operations and they could, with relative ease, become a routine feature of sugar cane culture. Estates converting to a well defined Louisiana bank type of culture could accommodate such check plots as a routine, even where cane is reaped mechanically.

At Frome, nutrition control was tied to seventy dispersed blocks laid down on an equal number of fields and reaped as 1st ratoons in 1960. Each block was a partial replicate of a 2^3 design with treatments being extra to the field practice, and with the extra nitrogen being applied in one treatment at the normal time, and in the other, approximately after 6 months growth. The latter was included specially to determine

TABLE XII

THE FERTILIZER POLICY OF INDIVIDUAL ESTATES, 1960–61

Estate	Mean lb. per acre	% area fertilized	Estate	Mean lb. per acre	% area fertilized	Estate	Mean lb. per acre	% area fertilized
(*a*) *Nitrogen:* N								
Caymanas	102·7	99	Sevens	93·1	100	Bernard Lodge	111·4	100
Monymusk	97·5	100	Jamaica Sugar Estates	82·9	98	Innswood	89·8	87
Richmond	58·7	90	Barnett	80·9	99	New Yarmouth	83·5	100
Long Pond	60·4	98	Worthy Park	76·6	100	Serge Island	72·1	99
Appleton	48·4	99	United Estates	78·1	100	Gray's Inn Central	93·1	100
Holland	63·1	93	Vale Royal	60·4	98	Hampden	31·5	100
						Rose Hall	47·1	100
(*b*) *Phosphate:* P_2O_5								
Bernard Lodge	—	—	Sevens	89·6	4	New Yarmouth	—	—
Monymusk	31·1	7	Innswood	—	—	Jamaica Sugar Estates	37·7	51
Long Pond	—	—	Caymanas	85·0	2	Serge Island	80·3	4
			Gray's Inn Central	—	—	Richmond	73·8	3
			Appleton	44·8	99	Worthy Park	21·8	62
			Barnett	61·2	11	United Estates	23·9	57
						Vale Royal	—	—
						Hampden	—	—
						Holland	18·8	34
						Rose Hall	45·1	100
(*c*) *Potash:* K_2O								
Bernard Lodge	78·1	28	Innswood	129·6	100	Jamaica Sugar Estates	59·1	51
Caymanas	81·6	54	Monymusk	72·5	28			
New Yarmouth	136·0	20	Richmond	69·4	67			
Sevens	68·3	2	United Estates	77·2	87			
Gray's Inn Central	—	—	Appleton	67·2	99			
Worthy Park	107·6	96	Barnett	98·5	86			
Vale Royal	135·4	100						
Rose Hall	67·4	100						
Holland	59·8	92						
Hampden	90·0	100						
Long Pond	135·4	100						
Serge Island	67·3	99						

whether widely split nitrogen applications are advisable; the plots were all leaf sampled. The average increase to be expected from the extra nitrogen treatment in 1st ratoons whether applied at the normal time or later, is approximately 4% in cane and sugar, but the responses vary greatly with fields. The responses are too variable to make any general change in nitrogen dressings. The general response to extra phosphorus (which means to phosphorus since the areas to which it was applied commercially were very limited) is small and amounts to about 1·5% but there are indications that areas occur where the nutrient will be required commercially. The most consistent responses were obtained to extra potash, the average response being about 5% in cane and over 7% in sugar.

Table XIII summarizes the distribution of laboratory analyses during the year.

Field experiment technique

A programme of work was initiated to compare methods of field experimentation in the light of changing labour conditions in the industry and also considering the availability of suitable response curves. The investigation has suggested that a wide coverage of experiments which can be reaped in one day and which partly by their numbers measure with greater precision, responses to standard dressings of nutrients might be most useful for routine control work.

TABLE XIII

LABORATORY ANALYSES UNDERTAKEN DURING 1960

1. *Leaf material:*

Estate	No. of	Estate	No. of	Estate	No. of
Appleton	144	Hampden	98	Richmond	153
Barnett	70	Holland	32	Serge Island	70
Bernard Lodge	466	Innswood	282	Sevens	212
Caymanas	106	Jamaica Sugar Estates	46	United Estates	164
Frome	757	Long Pond	165	Vale Royal	407
Gray's Inn Central	35	Monymusk	1,167	Worthy Park	526
		New Yarmouth	62		

2. *Soils:*

pH	$CaCO_3$	P_2O_5	K_2O	Miscellaneous
469	13	352	352	170

3. *Cane juices, sugars, molasses:*

Brix	Pol	Invert sugars	N	P_2O_5	K_2O
1,759	1,132	130	24	157	156

4. *Miscellaneous:*

N	P_2O_5	K_2O	Ca	Mg	Cu	D.M.
383	383	383	290	290	36	145

Total analyses .. 21,169

The aerial application of nitrogen dressings

The aerial application of urea was compared with the standard practice of applying equivalent quantities of nitrogen as sulphate of ammonia, at Innswood. Over a comparison of seventeen fields the response from urea was disappointing, both by leaf composition standards and in terms of cane per acre, and suggested that the response was only of the order of 80% of that given by sulphate of ammonia. Caution is therefore advised when evaluating the relative economy of these two sources of nitrogen. The mean pH of the surface soils of the area was 7·5, with some fields giving values as high as 8·0.

As a result of the above a formal experiment was laid out at Innswood during the year to compare the responses from urea and sulphate of ammonia using three methods of application for each—surface applied at the base of the cane stools; surface broadcast and, buried at the base of cane stools.

Chemical laboratory

The laboratory was continuously engaged in the analysis of leaf sample material, soils, export sugars, molasses, cane juices and other miscellaneous materials.

One part of the work dealt with design of the experiments while the other examined plot size whether large

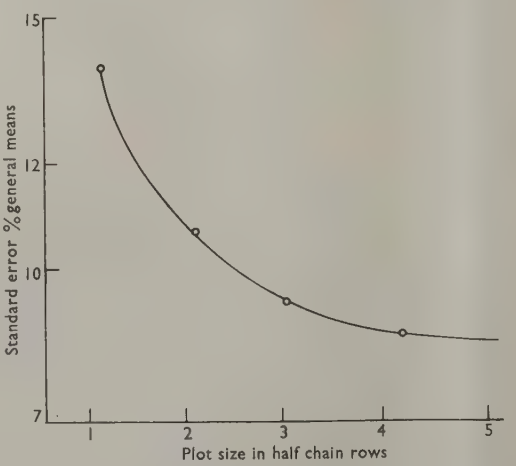


FIGURE 4

The relationship between plot size and experimental error

(1/12th to 1/10th acre) or small, the aim of a large plot being to simplify the reaping procedure. Further consideration was given to the size of the small plot, and the results, based on experimental error accruing (Figure 4) indicate that 4 rows × half chain may be the optimum. The results of nine trials in which each plot row was separately reaped and weighed indicate that plots of half chain by 4, 3 or 2 rows were highly significantly better than plots of 1 row by half chain and that 4 or 3 rows were significantly better than 2 rows. However, 4 rows were not significantly better than 3 rows. The mean errors (% general mean) for 1, 2, 3 and 4 rows were respectively 14·04, 10·76, 9·38 and 8·75. The extrapolated errors for 5 and 6 rows were 8·55 and 8·50% respectively. It therefore appears that only negligible increases in accuracy are to be gained from increases in plot size beyond 4 rows by half chain in the plant crop of fertilizer experiments.

As a result of this study a 4 × 4 latin square design using 4 half chain rows as the experimental unit, has been adopted for routine control work. The treatments for reasons indicated in last year's report are NP, NK, PK and control (no fertilizer).

Routine nutrition control in the industry

A programme of experiments designed to supplement the annual leaf sampling was started this year. Over forty of the newly adopted 4 × 4 latin square experiments were laid down over most of the industry as part of the programme which will review the fertilizer policies in the industry.

Further notes on potash nutrition on Agualta clays

At Monymusk

As part of the study of potash nutrition on the Monymusk Agualta clays, partially presented in last year's report, blocks of paired plots to study the effects of potash fertilization were dispersed over a number of fields at Exeter and Springfield sections of the estate. Highly significant increases in cane yield and juice quality resulted from surface dressing 2½ cwt. per acre muriate of potash, while the increase in sugar production was very highly significant. The results are summarized in Table XIV and refer to fourteen trials.

TABLE XIV

Data from Potash Trials on Agualta Clay Soils at Monymusk

	K_2O % d.m. leaf 5 month	Tons cane per acre	% Pol	Tons sugar per acre
No potash ..	1·13	33·4	9·99	3·33
Potash 2½ cwt. per acre KCl	1·27	37·4	10·57	3·97
Increase ..	0·14	4·1	0·58	0·64
% increase ..	12·3	12·3	5·80	19·20

When the data are fitted to response curves the optimum economic dressing appears to be slightly in excess of 1½ cwt. muriate of potash per acre under the cultivation practices operating when the trials were conducted.

Methods of fertilizer application

As a result of the early lag in potash uptake observed in the cane grown on some clay soils it was decided to examine means of getting the nutrient into the plant. Two of the ways being examined are sub-surface placement into the root zone and leaf feeding.

Sub-surface placement

Two trials were laid down at Innswood to study the effects of placing potash in a band below the cane sett before planting, and of incorporating potash in a mixture with the soil of the cane bank. Significant positive responses to early placement of potash were recorded in K^+ composition of the leaf as against dibbling at 6 weeks as normally done. Leaf weights were also boosted. The data are presented in Table XV.

TABLE XV

Data from Potash Placement Trials at Innswood

Leaf sample	KCl dibbled 6 weeks after planting	KCl mixed into bank before planting	KCl banded in bank before planting
Weight 3, 5, 7 months mean	100	106	107
K_2O % d.m. 3, 5 months mean	100	111*	110*

* = Significant at 20 : 1.

Leaf feeding

In this study drenching sprays of KCl solutions were used. To avert serious scorching of the foliage only a 5% aqueous solution was used with teepol as a wetting agent. 12 lb. K_2O per acre were sprayed on the cane at 2 months old. In one trial, leaf sampled 5 weeks after spraying, potash leaf composition increased by 12% over control (1·26% K_2O d.m.) to 1·42%. These figures represent the means of four treated plots as against five untreated plots in the same experiment. In a subsequent leaf sampling 7 weeks later there was no apparent differences between treated and untreated plots. The results from another trial were erratic.

In subsequent work only saturated solutions at fairly low volumes will be used. By so doing it is hoped that more nutrient material may be put on the cane leaves without scorching.

Results of some routine control trials reaped

On the lateritic soils of Gayles Valley farm, Hampden, two trials reaped confirmed the inferences from leaf analyses that phosphate fertilization would be beneficial. Mean response to 1 cwt. 40% superphosphate was a 20·5% increase in cane and 22·5% in sugar production. On a somewhat similar soil at United Estates a large response to phosphate was also recorded.

At Monymusk on the Agualta clays of Springfield

the trend towards increases due to potash pointed out earlier, was maintained. There was a 20% increase in sugar production—12% due to improved juice quality—in one trial.

Miscellaneous

Mixed fertilizer

Commercial mixed fertilizers have obvious advantages where their composition coincides with the dressings indicated by diagnostic techniques. Their evaluation compared with the equivalent plant food derived from the "straight" sources of NPK has become worthwhile in view of the prices at which mixed fertilizers are being offered and as a result of the increasing area of land requiring dressings of all three plant foods. Trials were laid out during the year to examine this subject.

The foliar application of chemicals for the improvement of cane quality

Work undertaken in Puerto Rico and in Louisiana by the U.S.D.A. suggested that, under circumstances not adequately understood, beneficial effects on cane quality might be obtained by the pre-harvest spraying of standing cane with phosphate solutions, e.g. with mono-ammonium phosphate, mono-potassium phosphate, ortho-phosphoric acid and ethyl ammonium phosphate. Quite outstanding responses were claimed by another party to a proprietary article containing ortho-phosphoric acid, and zinc and iron chelates.

An aerial spray of mono-potassium phosphate at 13 lb. P_2O_5 per acre was compared with no spraying and with a spray of the proprietary article at 1 gallon (U.S.) per acre at Monymusk early in February—eight replicates being used and each plot on each occasion being sampled at random and in duplicate. Sampling was undertaken the day before spraying and at four successive weekly intervals. The data showed that the variation within irrigated fields and within plots was very high for the purpose of such an experiment. Even where sampling was repeated within relatively small areas within each plot (plots = 0·5-1·0 acres), the error was of the order of 0·4 to 1·8 tons cane per ton sugar for a single sampling. This is ascribed mainly to the imperfections of irrigation water distribution under a half chain or chain, twig and furrow system coupled with the minor irregularities inherent in fields which have not been graded or land planed.

With the exception of one field which was associated with very high sampling errors, the effects were desirable in sign and suggested that responses might be sought after intervals of 2 to 4 weeks, mainly as a result of influencing brix, which attained encouraging levels of significance in the case of KH_2PO_4 (e.g. 16 to 1). Cane quality at the commencement of the trials varied between 9·58 and 10·44 ton cane per tons sugar.

Further replicated experiments were conducted at Bernard Lodge, Innswood and Frome, using a spray boom rather like a travelling goal post arrangement, on which T-jets were spaced. Plot size was reduced to 4 rows × 1 chain in length. Phosphate (P_2O_5) was applied at 0, 2·5, 6·3 and 15·0 lb. per acre both as mono-ammonium phosphate and mono-potassium phosphate, and two other chemicals classified as desiccants were also used, viz.:—

(*a*) Esso Oil No. 59G at 1·5 and 3·0 U.S. gallons per acre, and

(*b*) "Reglone," a quaternary ammonium compound, at 1·0 and 2·0 lb. active principle per acre.

Rain interfered with the experiments at all places but Frome. Sampling was carried out at times 0, 6, 13 and 20 days after treatment. The Frome results gave the following trends:—

TABLE XVI

THE MEAN EFFECTS OF CHEMICAL SPRAYS ON *Juice* QUALITY RELATIVE TO CONTROL = 100 AND ADJUSTED FOR JUICE QUALITY PRIOR TO THE APPLICATION OF THE CHEMICALS

	Days after spraying		
	6	13	20
Control	100	100	100
KH_2PO_4	109	104	110
$(NH_4)H_2PO_4$ ..	105	102	108
Esso oil 59G ..	115	103	109
Reglone	104	97	94

The results lead to no definite conclusions since an analysis of covariance did not establish any acceptable degree of significance to treatments. The work is to be continued.

We are grateful for the help we received at the estates concerned, particularly with respect to sampling and sample analysis.

F. VARIETIES

Distribution

The variety situation for 1960 was substantially the same as that for 1959, in that B41227, B42231 and B4362 increased slightly in importance to occupy 82% of the estates' acreage, and the other varieties, excepting Co331, declined further. Because of the poor juice quality experienced in recent years the estates have become anxious to obtain canes of higher sucrose content. It is likely that B42231 and B4362 will be grown in preference to B41227 in some instances, and the newer varieties with good juice, e.g. B51415, Eros and NCo310, will be given special trial. The objections to NCo310 when cane is burnt prior to harvest, are much reduced.

The changes in the variety picture are illustrated in Figure 5 and the data for the period 1956-60 are presented in Table XVII.

The distribution of the varieties in the various estate groups is shown in Tables XVIII and XIX.

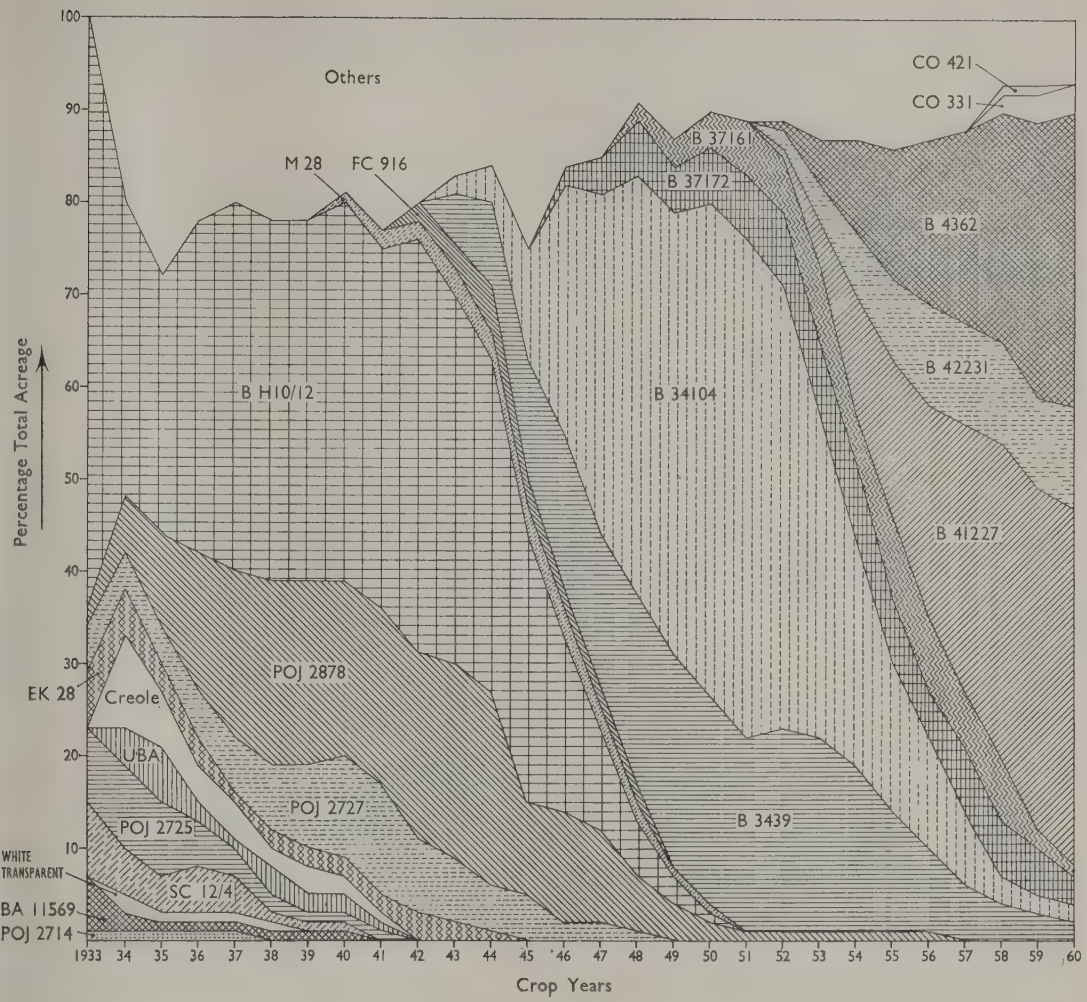


FIGURE 5

Percentage acreage under different varieties

TABLE XVII

ACREAGE UNDER VARIETY % TOTAL ACREAGE REAPED, 1956–60

Year	B3439	B34104	B37161	B37172	B41227	B42231	B4362	POJ2878	Co331	Co421	Others
1956	9	11	7	7	24	10	18	1	2	1	10
1957	6	8	6	7	29	11	21	–	2	1	9
1958	4	4	4	6	34	11	25	–	2	1	9
1959	2	3	2	5	37	10	30	–	3	1	7
1960	2	2	1	3	39	11	32	–	3	–	7

The data in Table XVIII show the following:—

(i) The Wet West estates and to a lesser extent the Central estates, depend almost entirely on B41227 and B4362.

Nco310 are being propagated. It is of the utmost importance that each estate runs full scale milling trials on these and all new varieties before they are widely extended.

TABLE XVIII

ESTATE GROUPS—ACREAGE UNDER VARIETY % TOTAL ACREAGE REAPED, 1959–60

Estate group	B3439		B34104		B37161		B37172		B41227		B42231		B4362		Co331		Co421		Others	
	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960
Wet West	–	–	1	1	1	1	1	–	46	50	2	2	44	43	–	–	–	–	4	4
Dry North	2	2	–	–	12	7	–	–	14	20	2	2	16	20	21	24	7	3	26	22
Irrigated	3	2	6	–	1	–	–	–	47	44	19	20	18	22	–	–	–	–	6	8
Wet East	3	3	–	–	1	–	34	26	11	13	2	2	41	42	–	–	–	–	8	14
Central	–	–	–	–	1	–	–	–	30	31	6	6	51	51	–	–	–	–	12	12
Island	2	2	3	1	2	1	5	3	37	39	10	11	30	32	3	3	1	–	7	7

TABLE XIX

ESTATE GROUPS—PLANT ACREAGE UNDER VARIETY % TOTAL PLANT ACREAGE REAPED, 1959–60

Estate group	B3439		B37161		B37172		B41227		B42231		B4362		Co331		Others		Total acreage	
	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960
Wet West	–	–	–	1	–	–	50	58	1	–	44	36	–	–	5	5	3,508	2,226
Dry North	–	–	1	–	–	–	30	26	1	–	20	23	24	23	24	28	1,529	1,431
Irrigated	1	2	–	–	–	–	40	31	20	22	28	33	–	–	11	13	4,727	7,582
Wet East	3	2	–	–	19	26	16	22	2	5	53	33	–	–	7	12	1,551	941
Central	–	–	2	–	–	–	30	32	8	6	43	49	–	–	17	13	576	454
Island	1	1	–	–	2	2	40	35	10	14	34	33	3	3	10	12	11,890	12,635

(ii) On the Dry North estates, B41227 is now equal to B4362 and Co331 in importance, and B37161, although decreasing rapidly, still occupies a fair percentage of the acreage.

(iii) On the Irrigated estates, B41227 is the dominant cane covering twice the area of its nearest rival, B4362, and more B42231 is grown in this area than any other, and

(iv) on the Wet East estates B4362 is the premier variety and B37172 makes its greatest contribution.

The information presented in Table XIX gives a clear indication of the entrenchment of B41227, B42231 and B4362 which again together account for 82% of the plant cane acreage. The desire of the estates to improve juice quality is reflected in the reduction of B41227 and the extension of B42231 and B4362 on the irrigated estates. These trends will be accelerated. However, B41227 is advancing on the Wet West estates. On the Wet East estates, where B37172 is recovering somewhat, there is a marked drop in the B4362 acreage. The high figure of 28% for the "Others" category on the Dry North Coast estates, is partly caused by the rapid extension of B49119, B51410 and NCo310, which may soon achieve commercial status. The same thing is happening elsewhere, particularly on the Irrigated and Central estates where B49119, B51410, B51415, BJ5417, Eros and

Cane class

The percentage acreage reaped in each cane class for the years 1957-60 is presented in Table XX.

TABLE XX

PERCENTAGE ACREAGE REAPED IN EACH CANE CLASS, 1957–60

Year	Cane Class					
	Fall plants	Spring plants	1st ratoons	2nd ratoons	3rd ratoons	Old canes
1957	3	10	16	20	18	33
1958	4	16	12	16	17	35
1959	8	14	18	11	13	36
1960	4	14	19	17	10	36

Performance

The performance of the varieties on the various estate groups is given in Tables IX, X and XI of Appendix I.

The productivity of the varieties by estates is presented in Table XII of Appendix I and also by areas for the years 1959 and 1960 in Table XXI below.

B41227, B42231 and B4362 were again, generally, the most productive varieties.

Comparison of varieties

The comparison of varieties showing actual yields and expressed as a percentage of B4362 is given in Table XIII of Appendix I.

Variety experiments

The number and distribution of variety experiments in operation during 1960 are given in Table XXII.

Results

(i) *Long season experiments*

The 1st ratoons of two of these trials were reaped after only 1 year's growth, and therefore have not fulfilled their purpose. The results are presented in Table XXIII, in the form of the order of merit.

H39/3633 was significantly better than B4362 in sugar production and B41227, B42231, H39/5803, H44/3098 and NCo310 outyielded B4362 in one trial. H39/5803 was vigorous and produced good juice. Note the good juice of NCo310.

H39/3633, H44/3098 and NCo310 were vigorous.

H32/8560 and Nco339 both gave good juice.

The surprising feature was the poor performance of H37/1933.

(ii) *Final trials*

(*a*) *B49's, B50's and B52 400's (2nd 500) series.* In all, fourteen of these trials were reaped as 2nd ratoons, and the results for the three crops are given on pages

TABLE XXI

CWT. THEORETICAL 96° SUGAR PER ACRE PER MONTH FOR VARIETIES BY ESTATE GROUPS, 1959–60

Varieties	Wet West		Dry North		Irrigated		Wet East		Central		Island	
	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960
B3439	5·31	—	4·45	3·95	5·74	6·28	5·23	4·75	—	—	5·47	5·70
B34104	2·55	6·26	4·45	4·61	4·42	5·39	5·48	6·05	—	—	4·18	5·40
B37161	5·06	5·64	4·43	4·89	4·60	4·89	6·08	3·85	5·95	6·61	4·64	5·03
B37172	5·61	5·42	—	6·05	—	—	6·08	5·08	—	—	6·05	5·09
B41227	5·81	5·85	4·96	5·00	5·02	6·12	5·96	5·63	7·03	7·13	5·40	6·00
B42231	6·19	5·98	4·75	5·38	5·52	5·77	5·26	4·99	6·68	6·45	5·57	5·77
B4362	6·37	6·51	4·50	5·15	5·88	6·78	5·82	5·11	7·54	7·05	6·12	6·34
Co331	4·88	5·95	4·84	4·91	2·39	—	—	—	—	—	4·79	4·94
Co421	—	—	4·37	4·95	—	—	—	—	—	—	4·37	4·95
Others	5·27	6·31	4·09	4·72	5·05	6·28	5·38	4·86	7·21	7·00	4·92	5·70
Average	5·97	6·14	4·52	4·93	5·25	6·19	5·85	5·12	7·28	7·03	5·54	5·97

TABLE XXII

NUMBER AND DISTRIBUTION OF VARIETY EXPERIMENTS IN OPERATION DURING 1960

	Fall Plants			Spring Plants		Ratoons				Long Season Trials			
	Planted 1958	Planted 1959	Planted 1960	Planted 1959	Planted 1960	Reaped 1960			To be reaped 1961	Reaped 1960	To be reaped		Total
	Reaped 1960	To be reaped 1961	To be reaped 1962	Reaped 1960	To be reaped 1961	1st	2nd	3rd			1961	1962	
Northern Division:													
Barnett	–	–	–	–	–	1	1	–	–	–	–	–	2
Hampden	1	–	–	–	–	–	–	–	1	–	–	–	2
Richmond/Llandovery	–	–	–	1	–	–	1	–	1	–	1	–	4
Rose Hall ..	–	–	–	–	–	–	–	–	–	–	–	–	–
Trelawny Estates ..	1	–	–	2	2	1	–	–	3	–	–	–	9
Central Division:													
Appleton	1	–	–	–	–	–	1	–	1	1	–	–	4
Frome	–	1	–	5	4	3	2	–	7	–	–	–	22
Holland	–	–	–	1	–	1	1	–	3	–	–	–	6
Monymusk	2	–	–	2	1	–	–	–	7	–	–	–	12
New Yarmouth ..	–	–	–	–	–	1	–	–	–	–	–	–	1
Sevens	–	–	–	–	–	1	1	–	1	1	1	–	5
Eastern Division:													
Bernard Lodge ..	–	–	–	1	2	1	2	–	1	–	–	–	7
Caymanas	–	–	–	–	–	1	1	–	2	–	1	–	5
Gray's Inn Central ..	–	1	–	1	–	–	–	–	1	–	–	–	3
Innswood	–	–	–	–	1	2	–	–	1	–	–	–	4
Jamaica Sugar Estates	2	2	–	–	–	1	–	–	1	–	–	–	6
Serge Island	–	–	–	–	1	1	1	–	–	–	–	–	3
United Estates ..	–	–	–	1	–	–	1	–	1	–	–	–	3
Worthy Park ..	–	–	–	–	1	2	–	–	2	–	–	–	5
Totals	7	4	–	14	12	16	12	–	33	2	3	–	103

40–51 of Appendix II, Part III. The performance of the varieties in 1960 is summarized below in the order of merit presented in Table XXIV.

The ratooning of B49119 in the experiments has been outstanding and as a result all estates have extended the variety. In general its cane yields have been very good but its juice quality only fairly good. Except for the Wet East estates where the stalks have been very thin, there is little doubt that B49119 will be grown on an increasing scale, provided its full-scale milling tests prove acceptable, especially with respect to fibre, which is probably higher than average.

B49198 has been fairly vigorous but produced very poor juice.

B49353 gave good juice but grew very poorly.

B49396 has been quite vigorous and yielded good juice but the stalks are much too thin.

B5037 has been vigorous and *produced very good juice.* The variety has been extended in some areas. On heavy land its growth has been disappointing, but on lighter soils in higher rainfall areas its performance has been encouraging.

B50347 has proven an attractive and vigorous cane but its juice quality is very poor.

B52405 has done fairly well.

B52407 has been vigorous and *yielded good juice.* It is being propagated on a limited scale.

B52408 has grown poorly.

B52409 has grown well and produced good juice *but the variety is very susceptible to mosaic.*

H37/1933 as usual has been vigorous but lacking in juice quality.

NCo310 has been quite vigorous and *gave very good juice.* Although its performance in experiments has been erratic, the variety has done well on a field scale at Monymusk and Trelawny Estates Limited. It is trashy, spiny and thin, but it tillers early and profusely, thus giving good weed control.

TABLE XXIII

SUMMARY OF LONG SEASON EXPERIMENT RESULTS

(Order of merit)

	Cane				Pol % Juice				Sugar			
Varieties	A	B	C	D	A	B	C	D	A	B	C	D
B37172	1	0	0	1	0	0	0	1	0	0	0	1
B41227	2	2	2	2	0	0	0	2	2	1	0	2
B42231	0	0	0	1	1	1	0	1	1	1	0	1
H32/8560	0	0	0	2	2	1	0	2	0	0	0	1
H37/1933	0	0	0	2	1	0	0	1	0	0	0	1
H39/3633	2	1	1	2	0	0	0	2	2	1	1	2
H39/5803	1	1	1	2	2	1	0	2	2	1	0	2
H39/7028	0	0	0	2	1	0	0	2	0	0	0	2
H44/3098	2	1	1	2	0	0	0	2	1	1	0	2
Nco310	2	1	0	2	1	0	0	2	1	1	0	2
Nco339	0	0	0	2	1	1	0	2	0	0	0	2

Standard = B4362.

A = Number of times placed in first 5.
B = Number of times better than standard (B4362).
C = Number of times significantly better than standard.
D = Number of experiments in which planted.

TABLE XXIV

SUMMARY OF B49's, B50's AND B52 400's RESULTS

(Order of merit)

		Cane				Pol % Juice				Sugar			
Varieties	Parentage	A	B	C	D	A	B	C	D	A	B	C	D
B49119	B35218 x B4098	14	13	5	14	8	7	0	13	13	12	2	13
B49198	B43283 x B41227	4	5	1	14	1	0	0	13	0	1	0	13
B49353	B37161 x POJ2878	0	2	0	11	3	3	0	10	0	2	0	10
B49396	Co421 x B45237	4	3	1	14	8	6	0	13	5	2	1	13
B5037	Co421 x B4098	3	6	0	13	11	11	1	12	5	5	1	12
B50347	B4362 x B4098	7	6	2	10	0	1	0	9	5	3	0	9
B52405	Co421 x B41227	3	4	0	13	2	3	0	12	2	4	0	12
B52407	B37161 x B41227	4	5	0	10	3	3	1	9	3	2	0	9
B52408	Co421 x B41211	0	0	0	1	1	0	0	1	0	0	0	1
B52409	Co421 x B41211	6	6	0	12	3	5	0	11	2	4	0	11
H37/1933	H32/8560 x H34/1874	5	5	1	8	2	1	0	8	3	5	0	8
Nco310	Co421 x Co31	3	4	0	12	7	6	1	11	5	4	1	11

Standard = B4362.

(*b*) *B51's and B53 400's (3rd 500) series.* The results of the experiments reaped this year are summarized below in Table XXV which presents the order of merit of the varieties and are given in detail on pages 52–57 of Appendix II, Part III.

The 3rd 500 series were not re-selections from the B51 First Year Seedling Trial, as previously stated, but were taken from the original B53 seedling nursery and so constitute the B53 400 series. The final numbering of the varieties under test is given in the order of merit table.

B5121 and B51131 have again done best and so have led the varieties of this group, both as plants and 1st ratoons. The former seems the more vigorous variety but the latter produces better juice. They both deserve trial on a very limited, exploratory field scale.

B53402 did poorly.

B53403. The variety is vigorous but yields poor juice.

B53407 did very badly.

B53408 was vigorous but produced very poor juice.

B53409 did fairly well.

B53410 grew well but its juice was very poor.

The two other varieties of the 3rd 500 series—B53404 (3/214) and B53405 (3/287) are being propagated because they did well last year; the former *has very good juice* and the latter is vigorous.

(*c*) *B52's, B53's, BJ54's and B54400 (4th 500) series.* Two experiments including these varieties were reaped, one as a 2nd ratoon and the other as a plant. The

TABLE XXV

SUMMARY OF B51's AND B53 400 RESULTS

(Order of merit)

Variety	Parentage	Cane				Pol % Juice				Sugar			
		A	B	C	D	A	B	C	D	A	B	C	D
B5121	Co421 x B34104	3	4	0	9	3	2	0	8	3	2	0	8
B51116	B4362 x B34104	1	2	0	5	3	2	0	4	1	1	0	4
B51131	B45170 x B41227	3	1	0	7	6	4	0	7	4	2	0	7
B51134	Co421 B37193	5	3	0	7	2	2	0	7	2	1	0	7
B51259	B40272 x Co290	3	3	0	9	2	3	0	8	2	1	0	8
B51374	Co421 B41211	2	1	0	7	1	0	0	7	1	0	0	7
B51410	B35207 x POJ2878	1	0	0	1	0	1	0	1	1	0	0	1
B51411	B35207 x POJ2878	1	0	0	1	0	0	0	1	0	0	0	1
B51414	B45170 x B41227	0	0	0	2	1	1	0	2	0	0	0	2
B53401 (3/21)	Co421 x B41211	2	3	0	6	1	1	0	6	1	0	0	6
B53402 (3/84)	B4596 x POJ2878	1	0	0	1	1	0	0	1	1	1	0	1
B53403 (3/206)	Co421 x B43375	2	1	0	5	0	1	0	4	0	0	0	4
B53406 (3/311)	B35207 x POJ2878	3	3	0	5	4	1	0	5	4	2	0	5
B53407 (3/335)	B45170 x B41227	0	0	0	1	1	0	0	1	0	0	0	5
B53408 (3/343)	B45170 x B41227	3	2	0	4	0	0	0	3	2	0	0	1
B53409 (3/365)	B45170 x B41227	1	0	0	2	1	2	0	2	2	1	0	3
B53410 (3/377)	B45170 x B41227	4	4	0	8	1	1	0	7	3	1	0	7

Standard = B4362.

B53404 (3/214) and B53405 (3/287) have been re-selected from late reaped lattice trials and are being extended.

A = Number of times placed in first 5.
B = Number of times better than standard (B4362).
C = Number of times significantly better than standard.
D = Number of experiments in which planted.

B51259 and B53406 (3/311) have done quite well.

B51259 is a thick-stalked vigorous variety but usually produces only fair quality juice.

B53406 has always been a vigorous attractive cane yielding fair juice but its extension was stopped in 1959 because of a suspected disease condition. In view of its continued good performance in experiments and that the disease was not confirmed, it should be given further trial.

B51116. The clone produces good juice but is very susceptible to eye spot and mosaic and has a sprawling habit. It is not worth extension.

B51134. The cane is very vigorous but produces poor juice. It is also thin-stalked and very tough. It does not seem a good prospect.

B51374. The juice quality of this variety is too poor and as it is only fairly vigorous, it must be discarded.

B53401. The cane grows vigorously but is too thin and yields only fair juice.

results are tabulated on page 58 of Part III of Appendix II.

The 4th 500 series were thought to be selections from the B52 first year seedling trial but were in fact taken from the seedling nursery of the B54 series. The list of clones of the B54400 series being tested intensively, their permanent numbering and their parentages are given below:—

B54401-4/61	.. B45170 x B41227
B54402-4/115	.. B35207 x POJ2878
B54403-4/387	.. Co421 x B46223
B54404-4/455	.. B42304 x B45151

The performance of the promising varieties is shown in Table XXVI.

B52107 is a promising variety. It is thick-stalked, free-trashing and fairly erect. The variety is doing very well in experiments in other islands and in British Guiana and seems destined to be grown commercially.

B52313 is rather thin-stalked, but tillers profusely. It grows vigorously and is very erect in habit. The cane produces good juice and arrows occasionally.

B52315 and B52389 are vigorous but have very poor juice.

H44/3098 was vigorous as a plant as usual. It remains to be seen whether it will ratoon successfully in the large plot trials and produce the good juice of which it is capable.

(*d*) *Miscellaneous varieties.* Two trials in which an assortment of varieties were planted were reaped at Frome and the results are given on page 59 of Appendix II, and are summarized in Table XXVII above.

The new varieties competed successfully with the standard B41227, and B51410 and B51415, in particular, did very well.

Because of its defects—rather thin stalks, excessive suckering and gormandizing, B51414 will not be extended. There is some suspicion concerning the ratooning of H44/3098 and the growth of Nco310 is sometimes uncertain. However, because of its good juice and very desirable characteristics—thick, clean stalks and good habit—Eros will be tried further.

(*e*) *Commercial varieties.* An experiment designed to re-assess the standard varieties—B3439, B41227 and B4362 was conducted at Richmond/Llandovery. The plant results are given below in Table XXVIII.

The plant results show clearly that B41227 and B4362 outyielded B3439, and under the conditions of the experiment produced juice of similar quality.

Lattice trials

(*a*) *B53's and foreign varieties.* One experiment of this series was reaped as a ratoon at New Yarmouth, and the results are given on page 60 of Part III of Appendix II.

TABLE XXVI

SUMMARY OF B52 AND B54 400 RESULTS

(Order of merit)

Variety	Parentage	Cane				Pol % Juice				Sugar			
		A	B	C	D	A	B	C	D	A	B	C	D
B52107	B4145 x B41227	2	1	0	2	1	0	0	1	1	0	0	1
B52313	Co421 x B41227	1	1	0	2	1	1	0	1	1	0	0	1
B52315	Co421 x B41227	1	1	0	2	0	0	0	1	1	0	0	1
B52389	Co421 x B4098	1	0	1	1	0	0	0	1	1	0	0	1
B53348	B4362 x B4098	0	0	0	1	No samples were taken for juice testing							
BJ5412	Co421 x B46223	0	0	0	1	ditto							
B54402 (4/115)	B35207 x POJ2878	1	0	0	1	ditto							
B54403 (4/387)	Co421 x B46223	0	0	0	1	ditto							
H44/3098	H32/8560 x ?	1	1	0	1	ditto							

Standard = B4362.

A = Number of times placed in first 5.
B = Number of times better than standard.
C = Number of times significantly better than standard.
D = Number of experiments in which planted.

TABLE XXVII

SUMMARY OF RESULTS

(Order of merit)

Variety	Parentage	Cane				Pol % Juice				Sugar			
		A	B	C	D	A	B	C	D	A	B	C	D
B49119	B35218 x B4098	2	1	0	2	0	2	0	2	2	2	0	2
B51410	B35207 x POJ2878	2	1	0	2	2	2	0	2	2	2	0	2
B51414	B45170 x B41227	1	1	0	2	2	2	0	2	2	2	0	2
B51415	B35206 x POJ2878	2	1	0	2	2	2	0	2	2	2	0	2
Eros	POJ2878 x 31MQ228	0	0	0	2	1	2	0	2	0	1	0	2
H44/3098	H32/8560 x ?	1	1	0	2	1	2	0	2	0	1	0	2
NCo310	Co421 x Co312	1	0	0	2	1	2	0	2	1	2	0	2

Standard = B41227.

A = Number of times placed in first 5.
B = Number of times better than standard (B41227).
C = Number of times significantly better than standard.
D = Number of experiments in which planted.

TABLE XXVIII

COMMERCIAL VARIETIES—PLANTS

Variety	Tons cane per acre	Pol % juice	Tons sugar per acre
B3439	84	99	83
B41227	34·7	10·45	3·62
B4362	100	100	101

The varieties were lacking in vigour compared with B42231 but most of them gave good juice. The two leading varieties were D62/43 and H38/2915. The former is erect but rather thin, and its performance in the trials has been only fair; the latter has done quite well in the experiments and is being grown on a fairly large scale at Worthy Park. It is erect in habit, medium thick and tillers quite well.

(*b*) *B54's, BJ54's, CP and Q varieties.* The 1st ratoon of six of these trials were reaped this year. The results

are given in detail on pages 61–63 of Part III of Appendix II.

The only variety which has done well as a ratoon and is not susceptible to mosaic is B54163. However, in view of the necessity to improve juice quality a number of the selections which are susceptible to mosaic but which produce good quality juice will be tried further. It is felt that the threat of mosaic has diminished sufficiently for the testing of susceptible varieties to be undertaken with caution. The varieties in question are B5277, B5387, B5401, B5480, B54142, B54262, BJ5429, Q47 and Q57.

Several other varieties—B5490, B45281 and BJ5413, will also be given further attention.

In other territories, B54142 is proving a very useful variety and so its future performance in Jamaica will be of interest.

(*c*) *BJ54 series.* The results of the one lattice trial testing the varieties of the series reaped in 1960 as a ratoon are given on page 64 of Appendix II, Part III.

TABLE XXIX

SUMMARY OF RESULTS B54, BJ54, CP AND Q SERIES

(Order of Merit)

Variety	Parentage	Mosaic	CANE					POL % JUICE					SUGAR					Remarks
			A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	
B5277	B37161 x B42231	S	0	1	1	0	5	0	3	2	0	5	1	1	1	0	5*	
B5387	B37172 x B42231	VS	2	3	2	0	6	1	4	3	0	6	2	4	2	0	0*	
B53200	Co421 x B41211		0	1	1	0	6	2	3	4	0	6	1	2	1	0	6	Free tillering but very thin-stalked
B5401	B3439 x B3337	S	0	2	0	0	5	3	4	4	0	5	3	4	0	0	5*	
B5463	B3439 x B45122		0	1	1	0	6	0	2	1	0	6	1	1	0	0	6	
B5480	B37172 x B4098	S	0	2	1	0	6	1	3	4	0	6	1	3	1	0	6*	
B5490	B37172 x B46347		0	2	2	0	6	3	5	4	0	6	2	4	1	0	6*	Very uneven growth
B54142	B44341 x B3337	S	0	1	0	0	3	1	1	2	0	3	1	1	0	0	3*	
B54163	B4099 x POJ2878		1	2	2	0	5	3	3	2	0	5	2	3	2	0	5*	
B54172	B47376 x B4098		0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	
B54193	Co421 x B41211	S	1	4	2	0	6	0	0	0	0	6	0	1	0	0	6	
B54262	B4362 x B4098	S	0	2	1	0	6	2	3	2	0	6	0	2	1	0	6*	
B54281	B45170 x POJ2878		2	3	0	0	4	0	1	2	0	4	2	3	0	0	4*	Very uneven growth. Heavy suckering
BJ5410	Co421 x B46223		1	1	1	1	2	0	0	0	0	2	1	1	1	0	2	Very thin stalked
BJ5413	Co421 x B46223		1	2	0	0	3	1	2	3	0	3	2	2	0	0	3*	Thin stalked, free tillering
BJ5425	B45170 x B41227		2	2	1	0	4	1	3	2	0	4	2	2	2	0	4	Uneven growth. Very tough stalks
BJ5428	B45170 x B41227		3	4	3	0	6	0	0	0	0	6	0	1	1	0	6	
BJ5429	B45170 x B41227	S	3	5	3	2	6	3	3	3	0	6	2	5	2	0	6*	
BJ5446	B45170 x POJ2878		1	1	1	1	6	0	2	0	0	6	1	1	1	0	6	
CP34/79			0	0	0	0	1	0	1	0	0	1	0	0	0	0	1	
CP34/120			1	1	1	0	1	0	1	0	0	1	1	1	1	0	1	Arrowing. Grassy
CP36/105			1	2	2	1	4	1	2	1	0	4	1	1	1	0	4	
CP36/111			1	5	2	1	6	0	0	0	0	6	0	1	1	0	6	Arrowing. Thin stalked
CP44/101	Co281 x CP1165		2	2	2	0	2	0	0	0	0	2	1	2	1	0	2	
CP44/154			1	2	2	1	6	0	0	1	0	6	1	2	2	0	6	Arrowing. Thin stalked
Q47		VS	3	5	4	0	6	0	2	1	0	6	2	5	1	0	6*	
Q50			0	0	0	0	6	1	2	1	0	6	0	0	0	0	6	
Q56			0	0	0	0	6	0	0	0	0	6	0	0	0	0	6	Very poor growth
Q57		S	0	1	1	0	6	3	4	4	0	6	1	1	2	0	6*	

Standard = B4362.

A = Number of times placed in first 5.
B = Number of times placed in first 10.
C = Number of times better than standard.
D = Number of times significantly better than standard.
E = Number of experiments in which planted.
* = Varieties to be observed further.

TABLE XXX

SUMMARY OF B53, B55 AND BJ56 VARIETIES RESULTS

(Order of merit)

Variety	Parentage	Mosaic	CANE					POL % JUICE					SUGAR				
			A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
B53208	Co421 x B45116	S	1	1	1	0	2	0	1	1	0	2	1	1	1	0	2
B53320	B39157 x B4098		1	2	1	0	3	0	1	0	0	2	1	1	1	0	3
B5411	B37161 x B47419		3	4	2	0	6	3	3	1	0	5	3	4	3	0	5
B54215	B37172 x B41211		1	2	1	0	5	3	3	3	0	4	2	3	2	0	4
B5557	B37161 x B4098		4	5	4	1	5	3	4	3	0	4	3	4	3	1	4
B55137	B4362 x B34104		0	0	0	0	5	2	4	2	0	4	1	2	0	0	4
B55244	Co421 x B41211		1	3	3	0	4	0	0	0	0	3	0	0	0	0	3
B55258	Co421 x B46223		3	4	4	0	4	0	0	1	0	3	1	1	1	0	3
B55317	B4362 x B4098		3	3	3	0	5	0	0	0	0	4	0	1	0	0	4
B55362	B3439 x B3337		1	2	1	0	2	1	1	1	0	1	1	1	1	0	1
H38/4443			2	2	2	0	3	2	2	1	0	3	2	2	2	0	3

Standard = B4362.

A = Number of times placed in first 5.
B = Number of times placed in first 10.
C = Number of times better than standard.
D = Number of times significantly better than standard
E = Number of experiments in which planted.

The best of the new selections was BJ5412 which is at present being tried in final experiments.

(*d*) *B53's, B55's and BJ56 varieties.* The plant crop of six of the experiments in which these varieties are being studied was reaped. The results are given on pages 65–69 of Appendix II, Part III.

The only variety to outyield the standard significantly was B5557, which was both vigorous and produced good quality juice.

B55258 was also very vigorous but gave poor juice. It is therefore unlikely that the variety will be acceptable.

B53208, B53320, B5411, B55362 and H48/4443 did well generally.

B54215 and B55137 produced good juice.

B55244 and B55317 were both vigorous but yielded poor quality juice.

The ratoon results next year will decide whether any of these varieties have any real promise.

Variety extensions

On the basis of the results of the experiments reaped in 1960 and in previous years, the estates have extended some of the newer varieties for local testing either in large plots or on field scale. The list of the selections and the estates on which they have been propagated is given in Table XXXI. Each variety must be given an adequate factory mill test by each estate before it is awarded any commercial status or released to cane farmers. Any commercial extension should only be undertaken after consultation with this department.

New experiments

The following experiments were laid down during the year.

(*a*) *Final trials*

The varieties included in the eight experiments planted in 1960 are listed in Table XXXII below. In an attempt to improve the accuracy of the trials the plot size was increased from 6 rows × half chain to either 8 or 9 rows × half chain so that the outside rows on either side of the plots can be treated as discard rows.

The experiments of this group will be laid down at Frome and Monymusk early in 1961.

TABLE XXXI

VARIETIES BEING EXTENDED BY ESTATES

Estate	Varieties
Appleton	B49119, B51410, B51414, B51415 and B51418
Barnett	B49119
Bernard Lodge	B49119, B5037, B51129, B51410, B51414, B51415, B52107, B52313, BJ5412, Eros, H44/3098 and NCo310
Caymanas	B49119, Eros, H44/3098 and NCo310
Frome	B49119, B51410, B51414, B51415 and Eros
Gray's Inn Central	B49119
Hampden	B49119
Holland	B49119 and H37/1933
Innswood	B49119, B5037, B51410, B52313 and H44/3098
Jamaica Sugar Estates	B49119, B5037 and B51415
Monymusk	B49119, B51129, B51134, B51374, B51410, B51414, B51415, B52107, Eros, H37/1933 and NCo310
New Yarmouth	B49119
Richmond/Llandovery	
Serge Island	B49119, B51415 and H44/3098
Sevens	B49119, B51129, B51415, B52107, B52313, Eros and H44/3098
Trelawny Estates	B49119, B51410 and NCo310
United Estates	B49119, B51410, B51415, B52107, B52313 and BJ5412
Worthy Park	B49119, B51134, B51415, B5387, BJ5417, BJ5462 and H38/2915

TABLE XXXII

LIST OF VARIETIES PLANTED IN FINAL TRIALS

Varieties	Bernard Lodge			Holland	Innswood	Serge Island	Sevens	Trelawny Estates
B49119	1	1	1	1	–	–	–	–
B51129	–	–	–	–	–	1	1	–
B51410	–	1	1	–	–	–	–	–
B51414	–	1	1	–	–	–	–	–
B51415	–	1	1	–	–	–	–	–
B52107	–	1	1	–	1	1	1	1
B52313	1	–	–	1	1	1	1	1
B52315	1	–	–	–	1	–	–	1
B53348	1	–	–	1	1	1	–	1
B54401 (4/61)	–	–	–	1	–	–	–	–
B54402 (4/115)	1	–	–	1	–	1	1	–
B54403 (4/387)	1	–	–	–	1	1	–	1
BJ5412	1	1	1	1	–	1	–	1
BJ5417	–	–	–	1	–	–	–	–
Eros	–	1	1	–	–	–	–	–
H44/3098	–	1	1	–	1	–	1	–
NCo310	–	1	1	–	–	–	–	–

TABLE XXXIII

List of Varieties Planted in Lattice Trials

Variety	Monymusk	Trelawny Estates	Worthy Park	Variety	Monymusk	Trelawny Estates	Worthy Park
B5407	–	1	–	B5660	1	1	–
B5427	1	1	–	B5686	1	1	1
B5437	–	1	–	B5695	1	1	1
B5474	1	1	1	B56102	1	1	1
B5483	1	1	–	B57156	–	–	1
B54113	–	–	1	B57176	–	–	1
B54140	1	1	–	BJ5708	1	1	1
B54224	–	–	1	BJ5709	1	1	1
B54232	1	–	1	BJ5726	1	–	1
B54272	1	1	–	BJ5731	1	–	1
BJ5733	–	1	–	BJ5751	1	1	1
BJ5736	–	1	–	BJ5752	1	1	–
BJ5738	1	1	1	Co618	–	1	–
BJ5741	1	1	–	Co775	–	–	1
BJ5742	1	–	1	PR980	–	1	1
BJ5743	1	1	1	Ragnar	1	–	1
BJ5746	1	1	–	Vesta	1	–	1

TABLE XXXIV

Varieties Being Propagated for Lattice Trials

Variety	Cay-manas	Hamp-den	Jamaica Sugar Estates	Variety	Cay-manas	Hamp-den	Jamaica Sugar Estates	Variety	Cay-manas	Hamp-den	Jamaica Sugar Estates
B5427	–	–	1	B55165	–	1	–	B55371	–	1	–
B5431	–	–	1	B55174	–	1	–	BJ5705*	1	–	1
B5444	–	–	1	B55176	–	–	1	BJ5706	–	–	1
B5471	–	–	1	B55178	–	1	–	BJ5713	–	–	1
B54130	–	–	1	B55184	–	1	–	BJ5721	–	–	1
B54144	–	–	1	B55216	–	1	–	BJ5730	–	–	1
B54163	–	–	1	B55227	–	1	1	BJ5736	–	–	1
B54209	–	–	1	B55228	–	1	–	BJ5738	–	–	1
B54229	–	–	1	B55230	–	1	–	BJ5741	–	–	1
B54241	–	–	1	B55231	–	1	–	BJ5742	–	–	1
B54249	–	–	1	B55235	–	–	1	BJ5749	–	–	1
B54272	–	–	1	B55236	–	1	–	BJ5751	–	–	1
B54282	–	–	1	B55239	–	1	1	BJ5753	–	–	1
B54289	–	–	1	B55240	–	1	–	B58137	1	–	–
B5525	–	–	1	B55241	–	1	–	B58143	1	–	–
B5526	–	–	1	B55242	–	1	1	B58150	1	–	–
B5527	1	–	–	B55243	–	1	–	B58166	1	–	–
B5533	–	–	1	B55247	–	1	–	B58169	1	–	–
B5543	–	1	–	B55255	–	1	–	B58176	1	–	–
B5544	–	1	1	B55257	–	1	–	BJ5802	1	–	–
B5546	–	–	1	B55260	–	1	–	BJ5803	1	–	–
B5555	–	–	1	B55261	–	1	–	BJ5804	1	–	–
B5568	–	1	1	B55262	–	–	1	BJ5805	1	–	–
B5572	–	1	1	B55265	–	–	1	BJ5806	1	–	–
B5574	–	1	–	B55267	–	1	–	BJ5809	1	–	–
B5576	–	–	1	B55280	–	1	–	BJ5811	1	–	–
B5577	–	1	–	B55281	–	1	–	BJ5812	1	–	–
B5583	–	1	–	B55283	–	1	–	BJ5813	1	–	–
B5593	–	1	1	B55286	–	1	–	BJ5814	1	–	–
B5596	–	1	1	B55306	–	1	–	BJ5816	1	–	–
B55103	–	–	1	B55322	–	1	1	BJ5818	1	–	–
B55110	–	1	–	B55340	–	1	–	BJ5821	1	–	–
B55111	–	1	–	B55347	–	1	–	BJ5822	1	–	–
B55131	–	1	–	B55349	–	1	–	BJ5823	1	–	–
B55134	–	1	–	B55350	–	1	1	BJ5825	1	–	–
B55140	–	1	–	B55352	–	1	–	BJ5826	1	–	–
B55142	–	1	1	B55355	–	1	–	BJ5827	1	–	–
B55143	–	1	–	B55365	–	1	–	BJ5828	1	–	–
B55152	–	–	1	B55369	–	1	–	BJ5829	1	–	–
B55156	–	1	–	B55370	–	1	1	BJ5831	1	–	–

* B5712, 36, 43, 87, 89, 91, 133, 141, 156, 176—only planted at Caymanas.

(*b*) *Lattice trials*

In order to make the lattice trials more reliable, the plot size was increased from 3 rows × half chain to 5 rows × half chain. This will permit the outside rows on both sides of the plots to be used as discard rows.

Three trials were initiated during the year. The list of varieties planted is given in Table XXXIII.

The varieties noted above, with the exception of B54232, BJ5741 and BJ5746, were sent to Bernard Lodge and Frome for propagation where they will be planted in lattice experiments, early in 1961. The following varieties of the B57 series were also sent:—

12, 36, 43, 87, 89, 91, 133 and 141.

Lattice trials will be planted on those estates in 1961.

Propagation nurseries

(i) *Regional*

In preparation for the 1961 Lattice Trial Planting Programme, three Regional Propagation Nurseries were established. The Hampden nursery was a substitute for Monymusk where no land was available at the time. In all, 130 varieties were extended as shown in Table XXXIV.

The development and disease reaction of the varieties in the propagation nurseries, with reference to their juice quality in earlier nurseries, will decide which ones are to be planted in the lattice trials. Lattice trials will be planted at Frome, Monymusk, Jamaica Sugar Estates, and one other irrigated estate.

(ii) *Estates*

Several estates are particularly interested in certain varieties, largely because of their juice quality, and have started to multiply them for local testing. The list of varieties concerned and the estates on which they are being grown are given in Table XXXV. This Table should be read in conjunction with Table XXXI.

TABLE XXXV

VARIETIES PLANTED IN ESTATE PROPAGATION NURSERIES

Variety	Estates
B51129	Gray's Inn Central and Serge Island
B51415	Gray's Inn Central
B52107	Gray's Inn Central
B52313	Gray's Inn Central
B52315	Gray's Inn Central
B53348	United Estates and Worthy Park
B54401 (4/61)	Bernard Lodge
B54402 (4/115)	Gray's Inn Central, Innswood and Sevens
B54403 (4/387)	Gray's Inn Central and Innswood
B54404 (4/455)	Gray's Inn Central and Monymusk
BJ5417	Frome
B5557	Bernard Lodge
B55258	Bernard Lodge
H39/3633	Sevens and Worthy Park
H39/5803	Trelawny Estates and Worthy Park
Pepe Cuca	Monymusk, Sevens, Trelawny Estates and Worthy Park

Pre-lattice selection programme

(i) *Stage 3 or quarter chain row nurseries*

(*a*) *B54's and BJ57's.*—The performance of the varieties in the nurseries at Jamaica Sugar Estates and Monymusk is assessed in Table XXXVI.

The vigorous varieties with fair to very good juice, the vigorous clones with good and very good juice and the fairly vigorous canes with very good juice were provisionally selected.

On inspection of the ratoon growth of the Jamaica Sugar Estates' Nursery the varieties listed in Table XXXIV were finally selected. The final selection and extension of the Monymusk varieties have been postponed until 1961.

(*b*) *B55's.* Three nurseries were harvested at Hampden, Jamaica Sugar Estates and Monymusk. The overall assessment of the varieties is presented in Table XXXVI.

The list of varieties finally selected and propagated at Hampden and Jamaica Sugar Estates is given in Table XXXIV. The selection at Monymusk will be extended in 1961.

(*c*) *BJ58's.* The nursery at Monymusk was reaped and the rating of the varieties is given in Table XXXVI.

The permanent numbers and parentages of the BJ58 selections are given in Table XXXVII and those extended at Caymanas are noted in Table XXXIV.

(ii) *Stage 2 or five stool nurseries*

(*a*) *B57's and BJ60's* (*F and BL58 series*). The nurseries at Frome and Bernard Lodge were reaped in 1960. A qualitative assessment of the selections based on a combination of cane yield and juice quality is presented in Table XXXVIII.

The clones considered very good and good will be planted in the Stage 3 nurseries and those classified as fair, will be re-selected. The ratoon growth of the nurseries indicates that thirty-seven of the B57's, seventy-nine of the Bernard Lodge BJ60's and fifty-eight of the Frome BJ60's may be planted in the Stage 3 nurseries early in 1961.

(*b*) *B58's.* The Stage 2 nurseries including the clones of this series were established at Caymanas and Frome. One hundred and twenty-two of the selections have been planted in the former nursery and ninety-six in the latter.

(*c*) *B59's.* One hundred and sixty-six mosaic-free varieties of this series were available for planting in Stage nurseries and 159 in all were extended at Caymanas and Frome in the late Fall.

(*d*) *BJ61's.* The selections from the seedling nurseries at Caymans, Frome and Jamaica Sugar Estates were planted in Stage 2 nurseries on the same estates.

At Frome the 107 selections were planted in the usual plots of 2 rows × one-eighth chain.

At Jamaica Sugar Estates the 928 selections were planted in plots of 2 rows × quarter chain. They were again selected visually after 6 to 7 months growth when the 164 most promising and vigorous canes were

TABLE XXXVI

Stage 3—Quarter Chain Row Nurseries

Vigour															
Very Good (>115) Juice				Good (90–115) Juice				Fair (75–89) Juice				Poor (>75) Juice			
VG	G	F	P	VG	G	F	P	VG	G	F	P	VG	G	F	P
							B54 Series								
	71 194	27 130	241	34 163	44 229 272 289	282	246	83 128 232 262 265	31 40 79 144 158 186 249 283	70 97 145	188	37, 38, 43, 45, 73, 85, 87, 113, 140 147 165 173 192 197 198 209 214 224 243 250 257 275	07 16 67 100 159 175 236 268	05 23 51 60 76 125 157 166 182 187 208 260 266 267 269	28 211 286 287
							B55 Series								
216	33 46 55 103 217 235 237 239 246 262 356 370 371	25 173 236 350		72 243	20, 26, 42, 43, 44, 68, 76, 77, 93, 96, 142 148 152 165 195 215 227 231 241 242 255 259 260 321 341 347 352 363	74 131 176 178 184 256 261 281 308 318 324 355 369	12		07, 27, 28, 62, 64, 83, 101 110 111 134 140 143 174 209 228 230 240 247 256 257 265 268 274 280 306 320 322 349	65 80 136 155 354	205 283	156 267 280 286 340	10 16 39 75 87 98 145 158 161 163 164 181 210 234 248 249 254 269 272 284 296 310 327 343 358	40 60 120 139 150 190 278 357	123
							BJ57 Series								
38 49 53				08 09 32 36	05, 06, 39, 41, 51, 52, 54	30	29	26 27 28 33 43 51	13 31	48		01, 02, 03, 04, 15, 16, 20, 34, 42	07, 12, 17, 21, 24, 25, 35, 44, 46, 47, 50	10 14	37
							BJ58 Series								
					S52 S71 S86	S174		S149	S3 S10 S27 S51 S58 S116 S127 S150 S152 S186	S4 S55 S115			F11 F20 F24 F30 F50 F52 F53 S29 S33 S64 S70 S72 S84 S94 S105 S128 S131 S133 S141 S159 S162 S179	F10 F19 F34 S95 S108 S148 S184	

extended in plots of 3 rows × 1 chain. These plots will be harvested and juice tested in order for a proper selection to be made in 1961.

(*c*) *BJ62's.* A total of 39,369 seedlings (comprised of 34,623 singles and 791 bunches, equivalent to 4,746 seedlings) were potted from 197 crosses.

TABLE XXXVII

PERMANENT NUMBERS OF THE BJ58 VARIETIES

Permanent number	Previous number	Parentage	Permanent number	Previous number	Parentage
BJ5801	S124	B35207 x POJ2878	BJ5817	F35	M134/32 x B4515
BJ5802	S33	B37172 x B41211	BJ5818	S150	POJ2878 x B34104
BJ5803	F30	B42279 x B4098	BJ5819	S100	POJ2878 x B41227
BJ5804	S115	B43349 x B47320	BJ5820	F17	POJ2878 x B4362
BJ5805	S159	B5037 x B41211	BJ5821	F19	POJ2878 x B4362
BJ5806	S174	B5037 x B41211	BJ5822	S27	POJ2878 x B4362
BJ5807	S1	B50215 x B42239	BJ5823	F52	H40/1184 x ?
BJ5808	S2	B50215 x B42239	BJ5824	S42	H40/1184 x ?
BJ5809	S10	B50215 x B42239	BJ5825	S52	H40/1184 x ?
BJ5810	S53	B51131 x B4098	BJ5826	F53	H41/3340 x ?
BJ5811	S71	F36/819 x B4744	BJ5827	S58	H44/2364 x ?
BJ5812	S86	H32/8560 x B34104	BJ5828	S184	H44/2364 x ?
BJ5813	S105	H32/8560 x B4098	BJ5829	S186	H44/2364 x ?
BJ5814	F11	H32/8560 x B45151	BJ5830	S190	H44/2364 x ?
BJ5815	F14	H32/8560 x B45151	BJ5831	S51	H47/2060 x ?
BJ5816	S152	H32/8560 x B45151			

However, at Caymanas only one stool was established of each of the 1,176 selections. These were re-selected after 7 months and 231 were noted for special attention. These varieties will be cut after a year's growth and juice tested before the final selection is made.

The details of selection are given in Tables XXXIX and XXXIX A.

(iii) *Single stool nurseries*

(*a*) *B59's.* There was no further incidence of mosaic among the 166 varieties planted in the Single Stool Nurseries at Caymanas and Frome. They were extended towards the end of the year.

(*b*) *B60's.* The setts of 344 varieties of the B60 series were received, and after sixty-six were re-imported, 336 varieties finally germinated. They were inoculated with mosaic and the following proved susceptible:—

05, 17, 27, 32, 40, 42, 43, 45, 64, 65, 75, 78, 86, 87, 91, 92, 94, 130, 181–183, 221, 244, 257, 260, 266, 270, 290, 304, 313, 317 and 323.

The survivors were planted in the Caymanas Nursery. The following varieties developed mosaic symptoms after transplanting:—

12, 16, 41, 44, 46, 54, 55, 60, 62, 63, 80, 85, 88, 89, 95, 132, 156, 162, 163, 176, 179, 186, 192, 225, 259, 262, 269, 274, 285, 295 and 299.

The mosaic free survivors will also be planted in the Frome Nursery in 1961.

The seedlings were shared between the nurseries as follows:—

Nursery	Singles	Bunches	Total
Frome	10,535	347 (≡2,082)	12,617
Innswood	11,365	415 (≡2,490)	13,855
Jamaica Sugar Estates	10,115	—	10,115
	32,015	762 (≡4,572)	36,587

The details of germination and distribution of seedlings to the nurseries are given in Table XL.

New introductions

Cuttings of the following foreign varieties were received during the year, germinated at Mandeville, and transplanted in the Caymanas Nursery:—

Country of origin	Varieties
Australia	
(Bureau of Sugar Expt. Sta.)	Q66, Q67, Q68, Q70, Badila
(Colonial Sugar Refining Co.)	Cadmus, Sirius
Hawaii	44-2364, 44-3098, 45-2708, 46-2404, 47-1914, 47-4991, 48-4605, 49-5
India	Co603, Co622
Mauritius	E1/37, M147/44, M31/45
South Africa	NCo310, NCo330
United States of America ..	CP44/155

In addition, B50112, B58141 and B58165 were re-imported from Barbados.

TABLE XXXVIII

STAGE 2 NURSERIES

B57's

Very good	Good	Fair	Poor
08, 09, 31, 36, 79 113, 128, 129	06, 38, 47, 48, 51, 55, 56, 67, 70, 72, 80, 91, 94, 115, 116, 123, 138, 141, 145, 168, 169, 178	07, 10, 13, 16, 18, 19, 25, 26, 27, 34, 40, 43, 57, 58, 69, 71, 76, 77, 78, 82, 85, 86, 90, 92, 98, 105, 114, 124, 125, 137, 139, 140, 148, 156, 162, 163, 166, 170, 173, 179	03, 05, 11, 12, 15, 20, 23, 24, 28, 32, 35, 37, 39, 41, 45, 54, 62, 65, 66, 73, 74, 97, 99, 101, 117, 118, 120, 122, 143, 147, 177

BJ60's—Bernard Lodge

01, 02*, 05, 65*, 191, 197, 287, 323, 329, 330, 333, 347	03, 08*, 12*, 13*, 14*, 16*, 50*, 51*, 61, 64*, 66*, 73*, 80, 98, 101, 106, 142*, 164, 177, 182*, 216*, 218 219, 221, 228*, 240, 241*, 242, 269*, 280*, 283*, 326, 332*, 334, 340, 358, 360, 364, 379, 396	06, 09, 10, 15, 17, 37, 44, 59, 60, 63*, 92, 93, 100, 125, 144, 162, 178, 180, 184, 186, 192, 193, 200, 212, 223, 224, 225*, 230*, 231*, 239, 256*, 265*, 284, 296*, 322*, 325*, 327*, 331*, 336*, 348, 366, 368, 373, 375, 381*, 382*, 391, 394	11, 20*, 21*, 35, 62, 77, 86, 87, 102, 103, 105, 109, 110, 140*, 148*, 175, 176*, 185, 188, 189, 196, 211, 214, 229, 266, 278*, 281*, 282, 285, 293, 294, 295, 318, 328*, 350*, 353, 354, 355, 362, 363*, 369, 370*, 372*, 376 378, 383, 384*, 390, 392, 393

Special Selections

28, 48, 57, 67, 111, 115, 232, 297, 303, 385	23, 24, 26, 29, 43, 54, 74, 112, 113, 114, 117, 123, 128, 155, 264, 289, 290, 298, 301, 302, 304, 307, 309, 346, 357, 387, 401	27, 30, 38, 40, 42, 45, 46, 47, 52, 68, 69, 75, 76, 81, 82, 85, 116, 119, 120, 129, 121, 131, 134, 135, 136, 137, 150, 151, 152, 154, 157, 158, 159, 161, 165, 168, 169, 172, 233, 235, 237, 243, 246, 250, 251, 252, 253, 254, 255, 259, 260, 261, 262, 267, 268, 299, 300, 305, 308, 312, 314, 316, 335, 338, 339, 341, 343, 344, 345, 356, 386, 399, 400, 404, 405, 408	25, 39, 41, 49, 53, 55, 56, 58, 70, 83, 84, 118, 122, 124, 132, 133, 153, 156, 160, 166, 167, 170, 171, 173, 174, 201, 202, 203, 204, 205, 206, 207, 234, 236, 238, 244, 245, 247, 248, 249, 258, 263, 270, 271, 272, 273, 274, 275, 276, 277, 288, 291, 306, 310, 311, 313, 315, 342, 388, 402, 403, 406, 407, 409

BJ60's—Frome

02, 04, 05, 10, 15, 21, 22, 25, 28, 29, 30, 38, 47, 81, 84, 92	03, 06, 07, 23, 26, 32, 33, 34, 35, 36, 39, 43, 44, 48, 49, 60, 65, 70, 75, 88, 103, 107, 114, 115	09, 12, 13, 16, 46, 51, 52, 54, 56, 62, 74, 77, 79, 80, 82, 83, 85, 86, 89, 93, 94, 97, 98, 100, 102, 104, 105, 108, 109, 110, 113, 116, 117	01, 08, 11, 14, 17, 18, 19, 20, 24, 27, 31, 37, 40, 42, 50, 53, 55, 57, 58, 59, 61, 63, 64, 66, 67, 71, 72, 73, 76, 78, 87, 90, 91, 95, 96, 99, 101, 106, 111, 112

Special Selections

159, 167, 168, 181, 187	135, 137, 158, 164, 174, 177, 198, 200, 201, 203, 235	121, 122, 127, 130, 134, 141, 142, 144, 147, 148, 150, 152, 155, 156, 157, 165, 171, 172, 179, 182, 183, 184, 186, 191, 193, 197, 199, 202, 204, 205, 213, 216, 217, 219, 221, 222, 224, 225, 226, 227, 228, 231	118, 119, 124, 125, 126, 128, 129, 131, 132, 133, 136, 138, 139, 140, 143, 145, 146, 149, 151, 153, 154, 160, 161, 162, 163, 166, 169, 170, 173, 175, 176, 178, 180, 185, 188, 189, 192, 194, 195, 196, 206, 207, 208, 209, 210, 211, 214, 215, 218, 220, 223, 229, 230, 232, 233, 234, 236, 237, 238

*Very attractive types at reaping.

TABLE XXXIX

BJ61 Series (1958-59 Seedlings) Selection Details

Parentage	Greenhouse			Transplanted				Mosaic						Deaths				Selected					
	Potted	Died	Mosaix	Caymanas	Frome	J.S.E.	All nurseries	Caymanas	Frome	J.S.E.	All nurseries	P & N	%	Caymanas	Frome	J.S.E.	All nurseries	S.A.S.	Caymanas	Frome	J.S.E.	All nurseries	%
Ball569 x B35276 ..	21	0	0	9	0	12	21	0	0	0	0	0	0	1	0	0	1	20	1	0	1	2	10
Ball569 x B4543 ..	30	0	3	15	0	12	27	1	0	1	2	5	18	0	0	2	2	23	0	0	1(1)	1(1)	4
Ball569 x B52107 ..	22	3	1	6	0	12	18	0	0	0	0	1	6	1	0	0	1	17	0	0	2	2	12
Ball569 x C343 ..	72	1	0	23	24	24	71	0	0	0	0	0	0	0	8	2	10	61	1	0	0	1	2
Ball569 x R3321 ..	17	5	1	11	0	0	11	0	0	0	0	1	8	0	0	0	0	11	1	0	0	1	9
B3365 x CP36/154 ..	269	16	9	64	90	90	244	2	1	0	3	12	5	6	0	1	7	234	7	0	6(1)	13(1)	6
B3439 x B4744 ..	45	2	0	19	0	24	43	0	0	0	0	0	0	0	0	2	2	41	5(2)	0	3	8(2)	20
B3439 x CP36/154 ..	11	0	1	0	10	0	10	0	0	0	0	1	9	0	0	0	0	10	0	0	0	0	0
B3439 x H37/1933 ..	13	1	3	9	0	0	9	0	0	0	0	3	25	0	0	0	0	9	2	0	0	2	22
B35207 x B52107 ..	154	2	11	45	48	48	141	0	1	0	1	12	8	2	5	1	8	132	10	1	4	15	11
B35207 xD251 ..	47	6	16	13	0	12	25	2	0	2	4	20	49	0	0	0	0	21	1	0	1	2	10
B35207 x NCo330 ..	4	1	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
B37161 x B4098 ..	148	1	1	50	48	48	146	0	4	1	5	6	4	0	1	0	1	140	12(5)	1	5(1)	18(6)	13
B37161 x B41211 ..	100	0	0	40	30	30	100	1	0	6	7	7	7	0	2	4	6	87	9(2)	1	2	12(2)	14
B37161 x B47258 ..	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B37161 x B51242 ..	18	2	0	4	12	0	16	0	0	0	0	0	0	1	0	0	1	15	1	0	0	1	7
B37161 x CP28/11 ..	171	0	0	75	48	48	171	0	0	0	0	0	0	0	0	1	1	170	19(9)	0	8(3)	27(12)	16
B37161 x Co213 ..	2	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
B37161 x Co270 ..	55	0	0	23	16	16	55	2	0	0	0	2	4	0	0	0	0	53	7	0	4	11	21
B37161 x Co413 ..	13	0	2	11	0	0	11	2	0	0	2	4	31	0	0	0	0	9	0	0	3	3	33
B37161 x Eros ..	402	18	48	96	120	120	336	6	31	11	48	96	25	1	0	2	3	285	32(7)	1	23(11)	56(18)	20
B37161 x Pindar ..	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
B37172 x B47258 ..	6	1	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
B37172 x Pindar ..	20	0	0	8	12	0	20	0	0	0	0	0	0	0	0	0	0	20	2(1)	0	0	0	0
B4096 x B41227 ..	93	4	0	17	36	36	89	0	0	0	0	0	0	0	0	3	3	86	4	0	4(1)	8(1)	9
B40272 x B4744 ..	33	0	1	8	12	12	32	0	0	0	0	1	3	0	0	0	0	32	1	0	2	3	9
B40272 x B5480 ..	5	0	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	5	3	0	0	3	60
B4214 x B45151 ..	262	9	0	73	90	90	253	0	0	0	0	0	0	3	11	2	16	237	4	3	11	18	8
B4214 x B49119 ..	87	0	8	31	24	24	79	0	1	0	1	9	10·5	0	2	0	2	76	2	0	3	5	7
B4214 x B51242 ..	539	5	5	169	180	180	529	11	7	0	18	23	4	6	2	2	10	501	18(5)	2	29(3)	49(8)	10
B4223 x Self ..	3	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
B4373 x B42231 ..	6	0	0	6	0	0	6	0	0	0	0	0	0	0	0	0	0	6	1	0	0	1	17
B43283 x D251 ..	565	77	14	162	156	156	474	0	13	0	13	27	6	4	0	4	8	453	22(2)	1	21(4)	44(6)	10
B43380 x B49119 ..	12	0	0	12	0	0	12	0	0	0	0	0	0	0	0	0	0	12	4(1)	0	0	4(1)	33
B4581 x B4098 ..	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	100
B45121 x B45151 ..	2,712	1,088	7	920	516	181	1,617	1	2	0	3	10	1	8	1	0	9	1,605	19(2)	1	11	31(2)	2
B45121 x B4744 ..	38	5	0	9	12	12	33	0	0	0	0	0	0	0	0	0	0	33	2	0	4	6	119·8 (18)
B45137 x B41227 ..	1,422	240	13	472	498	199	1,169	0	0	0	0	13	1	20	92	0	112	1,057	17(3)	1	36(8)	54(11)	5
B45137 x B48392 ..	308	2	48	78	90	90	258	4	5	7	16	64	21	1	5	0	6	236	13(4)	0	11(6)	24(10)	10
B45137 x B50382 ..	123	2	1	24	48	48	120	0	2	1	3	4	3	1	0	4	5	112	5	1	3	9	8
B45137 x B5121 ..	111	2	3	34	36	36	106	1	0	0	1	4	4	1	0	0	1	104	3	1	4(2)	8(2)	8
B45152 x B43214 ..	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
B45152 x Co270 ..	114	1	15	26	24	48	98	1	0	0	1	16	15	2	2	0	5	92	4	0	3(1)	7(1)	8
B45170 x B4744 ..	502	1	2	171	164	164	499	0	2	2	4	6	1	20	0	7	27	468	28(8)	5	20(3)	53(11)	11
B45220 x CP36/154 ..	80	0	0	32	24	24	80	0	0	0	0	2	3	3	1	0	4	76	2	0	0	2	3
B45225 x B4744 ..	1,626	357	9	708	360	192	1,260	0	0	0	0	0	0	52	132	6	190	1,070	4	3	10	17	2
B48306 x B37193 ..	93	0	4	17	24	48	89	0	0	2	2	11	13	0	3	5	8	79	2	1	3	6	8
B48306 x B4098 ..	305	11	20	94	90	90	274	0	1	0	1	5	2	0	0	1	1	272	20(3)	0	9(1)	29(4)	11
B48357 x B50135 ..	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
B5012 x B46364 ..	11	0	0	0	11	0	11	0	1	0	1	1	10	0	1	0	1	9	0	0	0	0	0
B5041 x B4738 ..	13	0	0	13	0	0	13	0	0	0	0	0	0	0	0	0	0	13	1(1)	0	0	1(1)	8
B5041 x B49119 ..	195	8	1	54	66	66	186	0	0	1	1	2	1	0	4	3	7	178	8(2)	1	5(3)	14(5)	8
B5041 x B54142 ..	107	1	0	34	36	36	106	0	2	0	2	2	2	0	0	3	3	101	5(2)	1	3	9(2)	9
B51129 x B45151 ..	8	0	0	8	0	0	8	0	0	0	0	0	0	0	0	0	0	8	3	0	0	3	37·5
B5222 x B43229 ..	37	6	0	7	12	12	31	0	0	0	0	0	0	0	0	0	0	31	1	0	2	3	10
B52321 x B43375 ..	263	2	7	74	90	90	254	2	3	0	5	12	5	0	0	0	0	249	19(7)	0	20(5)	39(12)	16
B52371 x B34104 ..	69	5	1	15	24	24	63	0	0	0	0	1	2	0	0	1	1	62	2(1)	0	3	5(1)	8
B52371 x D251 ..	446	20	10	152	132	132	416	0	2	1	3	13	3	0	0	3	3	412	25(4)	2	19(1)	46(5)	11
B52371 x D1122 ..	84	1	0	35	24	24	83	0	1	0	1	1	1	0	0	0	0	82	7(3)	0	5	12(3)	15
B52389 x B41227 ..	26	4	0	10	12	0	22	0	0	0	0	0	0	0	3	0	3	19	0	0	0	0	0
B52389 x B52107 ..	376	54	1	117	90	114	321	0	0	0	0	1	0·3	2	4	16	22	299	6(1)	0	7(1)	13(2)	4
B5336 x B4098 ..	157	7	0	54	48	48	150	0	2	0	2	2	1·4	0	3	0	3	145	18(5)	2	3	23(5)	16
B54243 x B41227 ..	6	0	1	5	0	0	5	0	0	0	0	1	17	0	0	0	0	5	2	0	0	2	

TABLE XXXIX—*continued*

Parentage	Greenhouse			Transplanted				Mosaic						Deaths					Selected				
	Potted	Died	Mosaic	Caymanas	Frome	J.S.E.	All nurseries	Caymanas	Frome	J.S.E.	All nurseries	P & N	%	Caymanas	Frome	J.S.E.	All nurseries	S.A.S.	Caymanas	Frome	J.S.E.	All nurseries	%
B5650 x B4098 ..	6	0	0	6	0	0	6	0	0	0	0	0	0	0	0	0	0	6	4(2)	0	0	4(2)	67
Co421 x B45151 ..	1,068	384	0	336	258	90	684	0	0	0	0	0	0	8	1	0	9	675	16(1)	2	13(3)	31(4)	4·5
Co421 x B46265 ..	939	14	0	265	330	330	925	0	1	0	1	1	0·11	6	8	6	20	904	34(4)	4	50(7)	88(11)	10
Co421 x B47320 ..	275	26	0	69	90	90	249	0	1	0	1	1	0·15	0	6	6	12	236	10(1)	0	14(1)	24(2)	10
Co421 x B52107 ..	781	89	1	235	228	228	691	1	2	0	3	4	1	6	1	0	7	681	35(4)	2	24(2)	61(6)	9
Co421 x D2452 ..	168	9	1	26	66	66	158	0	1	0	1	2	0·34	0	5	2	7	150	2	0	9	11	7
Co421 x D251 ..	1,044	442	3	311	240	48	599	0	0	1	1	4	1	6	0	2	8	590	1	0	3	4	1
D62/43 x B49119 ..	12	0	0	0	12	0	12	0	1	0	1	1	8	0	0	0	0	11	0	0	0	0	0
F36/819 x B4098 ..	4	0	1	3	0	0	3	0	0	0	1	1	25	0	0	0	0	3	2(1)	0	0	2(1)	67
F36/819 x B42231 ..	4	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	4	1	0	0	1	25
F36/819 x B4362 ..	6	1	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
F36/819 x B47380 ..	29	2	1	14	12	0	26	0	0	0	0	1	4	0	0	0	0	26	2	0	0	2	8
F36/819 x B5480 ..	6	0	0	6	0	0	6	0	0	0	0	0	0	0	0	0	0	6	2	0	0	2	33
H32/8560 x B37193 ..	9	0	1	8	0	0	8	0	0	0	0	1	11	0	0	0	0	8	3(1)	0	0	3(1)	37·5
H32/8560 x B47258 ..	5	0	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	5	4	0	0	4	80
H32/8560 x B5121 ..	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M134/32 x B47258 ..	52	2	2	0	24	24	48	0	0	0	0	2	4	0	0	0	0	48	0	1	11(1)	12(1)	25
M134/32 x B47314 ..	3	0	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
M134/32 x D1421 ..	3	0	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	2	0	0	0	0	0
Othaeite x B47156 ..	125	0	0	29	48	48	125	0	0	1	1	1	1	0	0	0	0	124	4	0	6	10	8
Othaeite x B51152 ..	22	0	2	8	0	12	20	0	0	0	0	2	10	0	0	1	1	19	3	0	1	4	21
Othaeite x B51269 ..	30	1	0	5	12	12	29	0	0	0	0	0	0	1	1	0	2	27	0	0	0	0	0
POJ3016 x B41227 ..	147	1	1	49	48	48	145	0	0	0	0	1	1	1	0	1	2	143	10(1)	1	9	20(1)	14
PR1000 x B47258 ..	1,108	41	8	351	354	354	1,059	0	4	0	4	12	1	3	2	5	10	1,045	72(11)	5	39(3)	116(14)	11
Trojan x B46364 ..	78	1	9	20	24	24	68	0	0	1	1	10	13	0	0	0	0	67	4(3)	0	1	5(3)	7
Trojan x B49119 ..	97	3	8	14	24	48	86	0	2	0	2	10	11	0	0	0	0	84	4	2	0	6	7
Trojan x B51152 ..	60	0	9	15	12	24	51	0	0	0	0	9	15	0	1	0	1	50	5	0	2(1)	7(1)	14
Trojan x B52214 ..	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Trojan x 32MQ629 ..	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	100
A133 x G331 ..	2	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
B1125 x E2411 ..	8	0	0	8	0	0	8	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0
B441 x D213 ..	8	0	0	8	0	0	8	0	0	0	0	0	0	0	0	0	0	8	1(1)	0	0	1(1)	12·5
R334 x D1122 ..	17	0	9	8	0	0	8	1	0	0	1	10	59	0	0	0	0	7	0	0	0	0	0
P4	50	2	0	16	16	16	48	0	0	0	0	0	0	0	0	0	0	48	2	0	6(1)	8(1)	17
P7	314	7	4	87	108	108	303	0	1	0	1	5	2	3	0	1	4	298	17	0	9(2)	26(2)	9
P9	2,784	341	1	1,138	1,014	290	2,442	0	1	0	1	2	0·09	65	112	2	179	2,262	41(8)	8	42(4)	91(12)	4
P10	25	3	0	10	12	0	22	0	0	0	0	0	0	2	0	0	2	20	0	0	0	0	0
P12	324	30	30	84	90	90	264	1	3	2	6	36	13	0	12	10	22	236	18(5)	0	11(1)	29(6)	12
P14	530	9	4	205	156	156	517	0	0	0	0	4	1	0	0	4	4	513	29(6)	3	39(9)	71(15)	14
P16	9	1	0	8	0	0	8	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0
P17	98	0	6	44	24	24	92	0	0	0	0	6	6	0	0	1	1	91	11(1)	0	3	14(1)	15
P19	72	3	0	21	24	24	69	0	1	1	2	2	3	1	1	2	4	63	0	0	2	2	3
P20	194	1	2	59	66	66	191	0	0	0	0	2	1	0	0	0	0	191	30(6)	0	16(3)	46(9)	24
P22	13	0	0	13	0	0	13	0	0	0	0	0	0	0	0	0	0	13	3(1)	0	0	3(1)	23
P24	2,034	131	1	790	780	332	1,902	0	2	0	2	3	0·16	6	44	0	50	1,850	48(9)	3	25(6)	76(15)	4
P25	174	8	3	31	66	66	163	0	0	0	0	3	2	0	0	1	1	162	5(2)	0	12(3)	17(5)	10
P26	161	16	0	49	48	48	145	0	1	1	2	2	1	0	1	0	1	142	9(3)	0	6(1)	15(4)	10·5
P27	1,337	15	6	392	462	462	1,316	0	2	0	2	8	0·6	2	0	10	12	1,302	52(16)	8	132(29)	192(45)	15
P28	116	1	6	45	32	32	109	0	1	0	1	7	6	0	0	1	1	107	14(6)	0	8(6)	22(12)	20·5
P29	22	2	0	8	12	0	20	0	0	0	0	0	0	0	0	0	0	20	2	0	0	2	10
P30	980	8	10	302	330	330	962	0	0	0	0	10	1	4	6	3	13	949	47(3)	5	23(2)	75(5)	8
P31	807	403	3	137	132	132	401	0	2	0	2	5	1	2	13	2	17	382	17(1)	1	7	25(1)	6·5
P32	4,194	871	6	1,329	1,344	644	3,317	1	1	1	3	9	0·27	25	2	1	28	3,286	38(28)	20	57(10)	165(38)	5
P33	3,924	480	3	1,545	1,716	180	3,441	0	4	0	4	7	0·21	37	25	0	62	3,375	55(9)	–	15(6)	70(15)	2
P34	1,143	557	0	238	324	24	586	0	0	0	0	0	0	0	0	1	1	585	4(2)	0	0	4(2)	1
P35	62	0	2	12	24	24	60	0	0	0	0	2	3	0	0	0	0	60	4(2)	0	6(3)	10(5)	17
P36	1,968	217	31	790	600	330	1,720	1	10	8	19	50	3	14	4	2	20	1,681	60(12)	10	12(4)	82(16)	5
P37	27	0	1	14	12	0	26	0	0	0	0	1	4	0	0	0	0	26	6(1)	0	0	6(1)	23
P38	105	7	0	26	36	36	98	0	0	0	0	0	0	2	2	3	7	91	3	0	2	5	5
P39	65	0	1	16	24	24	64	0	0	0	0	1	2	2	0	0	2	62	1	0	2	3	5
	40,133	6,102	444	13,410	12,621	7,556	33,587	41	122	51	214	642	2·32	333	529	142	1,004	32,369	1,176(31)	107	928(164)	2,211(395)	

P & N = Pot and nursery totals combined. S.A.S. = Seedlings available for selection.

N.B.—The numbers in brackets represent the number of seedlings re-selected in the Caymanas and Jamaica Sugar Estates Nurseries.

TABLE XXXIX A.

BJ 61 Series (1958-59 Seedlings). Selection Details for Crosses with Bunch Plants.

Cross	Parentage	Potted			Died			Transplanted						J.S.E. Singles	All Nurseries			Field Mosaic
								Caymanas			Frome							
		Singles	Bunches	Total	Singles	Bunches	Total	Singles	Bunches	Total	Singles	Bunches	Total		Singles	Bunches	Total	
50	B45121 x B45151	1,488	102 x 12 1,224	2,712	1,052	3 x 12 36	1,088	116	67 x 12 804	920	132	32 x 12 384	516	181	429	1,188	1,617	3
52	B45137 x B41227	804	103 x 6 618	1,422	234	1 x 6 6	240	160	52 x 6 312	472	198	50 x 6 300	498	199	557	612	1,169	0
64	B45225 x B4744	762	72 x 12 864	1,626	237	10 x 12 120	357	156	46 x 12 552	708	168	16 x 12 192	360	192	516	744	1,260	0
93	Co421 x B45151	600	39 x 12 468	1,068	384	0	384	60	23 x 12 276	336	66	16 x 12 192	258	90	216	468	684	0
98	Co421 x D251	552	41 x 12 492	1,044	394	4 x 12 48	442	59	21 x 12 252	311	48	16 x 12 192	240	48	155	444	599	1
142	P9	1,128	276 x 6 1,656	2,784	293	8 x 6 48	341	280	143 x 6 858	1,138	264	125 x 6 750	1,014	290	834	1,608	2,442	1
155	P24	1,050	164 x 6 984	2,034	101	5 x 6 30	131	286	84 x 6 504	790	330	75 x 6 450	780	332	948	954	1,902	2
163	P32	2,598	266 x 6 1,596	4,194	775	16 x 6 96	871	579	125 x 6 750	1,329	594	125 x 6 750	1,344	644	1,817	1,500	3,317	3
164	P33	900	252 x 12 3,024	3,924	396	7 x 12 84	480	141	117 x 12 1,404	1,545	180	128 x 12 1,536	1,716	180	501	2,940	3,441	4
165	P34	363	65 x 12 780	1,143	293	22 x 12 264	557	22	18 x 12 216	238	24	25 x 12 300	324	24	70	516	586	0
167	P36	1,176	132 x 6 792	1,968	199	3 x 6 18	217	316	79 x 6 474	790	300	50 x 6 300	600	330	946	774	1,720	19
		11,421	12,498	23,919	4,358	750	5,108	2,175	6,402	8,577	2,304	5,346	7,650	2,510	6,989	11,748	18,737	33

TABLE XXXIX A.—*continued*

Cross	Parentage	Deaths										S.A.S.	Selected									
		Caymanas			Frome			J.S.E. Singles	All Nurseries				Caymanas			Frome			J.S.E. Singles	All Nurseries		
		S	B	Total	S	B	Total		S	B	Total		S	B	Total	S	B	Total		S	B	Totals
50	B45121 x B45151	8	0	8	1	0	1	0	9	0	9	1,605	16(2)	3	19(2)	0	1	1	11	27(2)	4	31(2)
52	B45137 x B41227	14	1 x 6 6	20	2	90	92	0	16	96	112	1,057	13(3)	4	17(3)	1	0	1	36(8)	50(11)	4	54(11)
64	B45225 x B4744	40	1 x 12 12	52	0	11 x 12 132	132	6	46	144	190	1,070	1	3	4	0	3	3	10	11	6	17
93	Co421 x B45151	8	0	8	1	0	1	0	9	0	9	675	14(1)	2	16(1)	1	1	2	13(3)	28(4)	3	31(4)
98	Co421 x D251	6	0	6	0	0	0	2	8	0	8	590	1	0	1	0	0	0	3	4	0	4
142	P9	23	7 x 6 42	65	4	18 x 6 108	112	2	29	150	179	2,262	22(3)	19(5)	41(8)	8	0	8	42(4)	72(7)	19(5)	91(12)
155	P24	6	0	6	2	7 x 6 42	44	0	8	42	50	1,850	48(9)	0	48(9)	3	0	3	25(6)	76(15)	0	76(15)
163	P32	19	6 x 1 6	25	2	0	2	1	22	6	28	3,286	72(23)	16(5)	88(28)	20	0	20	57(10)	149(33)	16(5)	165(38)
164	P33	1	12 x 3 36	37	1	2 x 12 24	25	0	2	60	62	3,375	20(5)	35(4)	55(9)	0	0	0	15(6)	35(11)	35(4)	70(15)
165	P34	0	0	0	0	0	0	1	1	0	1	585	2(1)	2(1)	4(2)	0	0	0	0	2(1)	2(1)	4(2)
167	P36	14	0	14	4	0	4	2	20	0	20	1,681	47(8)	13(4)	60(12)	10	0	10	12(4)	69(12)	13(4)	82(16)
		139	102	241	17	396	413	114	170	498	668	18,036	256(55)	97(19)	353(74)	43	5	48	224(41)	523(96)	102(19)	625(115)

S = Singles. B = Bunches.

N.B.—The numbers in brackets represent the number of seedlings which were re-selected.

TABLE XL

BJ62 Series (1959-60 Seedlings) Germination Details

Parentage	Potted			Died			MO	Transplanted									
								Frome			Innswood			J.S.E.	All nurseries		
	A	B	C	A	B	C		A	B	C	A	B	C	A	A	B	C
Ball569 x B35276	3	—	3	2	—	2	—	—	—	—	1	—	1	—	1	—	1
Ball569 x B47157	59	—	59	6	—	6	—	18	—	18	17	—	17	18	53	—	53
Ball569 x B47198	13	—	13	—	—	—	—	6	—	6	7	—	7	—	13	—	13
Ball569 x B48394	7	—	7	—	—	—	—	—	—	—	7	—	7	—	7	—	7
Ball569 x NCo330	6	—	6	—	—	—	—	—	—	—	6	—	6	—	6	—	6
B3365 x B42231	39	—	39	7	—	7	2	12	—	12	18	—	18	—	30	—	30
B3365 x B45151	545	—	545	4	—	4	1	198	—	198	198	—	198	144	540	—	540
B3365 x B49119	74	—	74	11	—	11	2	20	—	20	21	—	21	20	61	—	61
B3365 x CP44/101	23	—	23	3	—	3	1	12	—	12	7	—	7	—	19	—	19
B3365 x Co775	12	—	12	1	—	1	—	6	—	6	5	—	5	—	11	—	11
B3365 x NCo310	8	—	8	1	—	1	—	—	—	—	7	—	7	—	7	—	7
B3439 x B45151	118	—	118	3	—	3	1	36	—	36	42	—	42	36	114	—	114
B3439 x B50377	938	—	938	16	—	16	3	312	—	312	312	—	312	295	919	—	919
B3439 x Eros	253	582	835	2	96	98	—	90	240	330	90	246	336	71	251	486	737
B3439 x NCo310	781	—	781	51	—	51	—	246	—	246	246	—	246	238	730	—	730
B3439 x Pindar	19	—	19	—	—	—	—	8	—	8	11	—	11	—	19	—	19
B3439 x Q50	167	—	167	1	—	1	1	48	—	48	69	—	69	48	165	—	165
B35247 x B45151	1,318	630	1,948	280	12	292	—	369	210	579	334	408	742	335	1,038	618	1,656
B37161 x CP29/116	4	—	4	—	—	—	—	—	—	—	4	—	4	—	4	—	4
B37172 x CL41/223	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
B37172 x NCo310	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
B39220 x Self	5	—	5	—	—	—	—	—	—	—	5	—	5	—	5	—	5
B39254 x B42231	80	—	80	7	—	7	1	24	—	24	24	—	24	24	72	—	72
B39254 x B45109	15	—	15	—	—	—	—	8	—	8	7	—	7	—	15	—	15
B39254 x B4738	2	—	2	—	—	—	—	—	—	—	2	—	2	—	2	—	2
B39254 x Co270	3	—	3	1	—	1	—	—	—	—	2	—	2	—	2	—	2
B40105 x B49119	124	—	124	3	—	3	—	48	—	48	49	—	49	24	121	—	121
B4145 x B4744	54	—	54	—	—	—	1	15	—	15	22	—	22	16	53	—	53
B4145 x NCo310	1	—	1	—	—	—	1	—	—	—	1	—	1	—	1	—	1
B4214 x B4098	10	—	10	—	—	—	5	—	—	—	5	—	5	—	5	—	5
B42231 x Self	20	—	20	4	—	4	—	8	—	8	8	—	8	—	16	—	16
B42279 x B49119	15	—	15	—	—	—	—	8	—	8	7	—	7	—	15	—	15
B42304 x B45151	502	696	1,198	49	—	49	4	156	300	456	156	396	551	137	449	696	1,145
B4373 x B45151	542	—	542	12	—	12	3	168	—	168	203	—	203	156	527	—	527
B4373 x CL41/223	2	—	2	—	—	—	—	—	—	—	2	—	2	—	2	—	2
B4381 x B5213	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
B43283 x B42231	47	—	47	1	—	1	—	16	—	16	18	—	18	12	46	—	46
B43283 x B45151	9	—	9	1	—	1	—	—	—	—	8	—	8	—	8	—	8
B43295 x B4098	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
B43295 x B47320	7	—	7	5	—	5	—	—	—	—	2	—	2	—	2	—	2
B43295 x B49119	9	—	9	—	—	—	—	—	—	—	9	—	9	—	9	—	9
B44111 x B4098	501	—	501	72	—	72	—	144	—	144	132	—	132	153	429	—	429
B44130 x Comus	24	—	24	1	—	1	—	12	—	12	11	—	11	—	23	—	23
B44132 x Comus	13	—	13	—	—	—	—	6	—	6	7	—	7	—	13	—	13
B45115 x B49119	2	—	2	—	—	—	—	—	—	—	2	—	2	—	2	—	2
B45119 x B49119	110	—	110	3	—	3	2	36	—	36	33	—	33	36	105	—	105
B45137 x B49380	108	—	108	16	—	16	11	24	—	24	24	—	24	33	81	—	81
B45137 x B51355	43	—	43	—	—	—	—	12	—	12	19	—	19	12	43	—	43
B45152 x B4098	372	—	372	6	—	6	2	114	—	114	114	—	114	136	364	—	364
B45152 x B41211	73	—	73	—	—	—	10	24	—	24	19	—	19	20	63	—	63
B45152 x B45151	13	—	13	—	—	—	—	6	—	6	7	—	7	—	13	—	13
B45152 x B49224	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
B45152 x B52298	46	—	46	—	—	—	—	12	—	12	22	—	22	12	46	—	46
B45152 x B5398	2	—	2	—	—	—	—	—	—	—	2	—	2	—	2	—	2
B45152 x F31/962	3	—	3	—	—	—	—	—	—	—	3	—	3	—	3	—	3
B45154 x B45109	9	—	9	1	—	1	1	—	—	—	7	—	7	—	7	—	7
B45154 x B45151	470	—	470	5	—	5	—	156	—	156	156	—	156	153	465	—	465
B45198 x B41276	3	—	3	—	—	—	—	—	—	—	3	—	3	—	3	—	3
B45198 x B4744	4	—	4	2	—	2	—	—	—	—	2	—	2	—	2	—	2
B45220 x B54163	33	—	33	—	—	—	1	8	—	8	12	—	12	12	32	—	32
B4744 x Self	38	—	38	8	—	8	7	12	—	12	11	—	11	—	23	—	23
B48361 x B4744	40	—	40	5	—	5	4	12	—	12	7	—	7	12	31	—	31
B5012 x B45151	165	—	165	6	—	6	2	52	—	52	57	—	57	48	157	—	157
B5012 x B4738	174	—	174	9	—	9	—	48	—	48	48	—	48	69	165	—	165
B5012 x Co331	8	—	8	1	—	1	—	—	—	—	7	—	7	—	7	—	7
B5028 x Co290	421	—	421	3	—	3	3	132	—	132	132	—	132	151	415	—	415
B5028 x Pindar	102	—	102	7	—	7	50	24	—	24	9	—	9	12	45	—	45

TABLE LX—*continued*

Parentage	Potted			Died			MO	Transplanted								
								Frome			Innswood			J.S.E.	All nurseries		
	A	B	C	A	B	C		A	B	C	A	B	C	A	A	B	C
B5041 x B45266	5	—	5	1	—	1	—	—	—	—	4	—	4	—	4	—	4
B50146 x B49257	4	—	4	—	—	—	—	—	—	—	4	—	4	—	4	—	4
B50146 x B50377	25	—	25	—	—	—	—	8	—	8	9	—	9	8	25	—	25
B50210 x B44236	2	—	2	1	—	1	—	—	—	—	1	—	1	—	1	—	1
B50210 x B45151	17	—	17	2	—	2	—	8	—	8	7	—	7	—	15	—	15
B50210 x B54142	235	—	235	1	—	1	1	78	—	78	89	—	89	66	233	—	233
B50210 x Pindar	60	—	60	6	—	6	—	18	—	18	18	—	18	18	54	—	54
B51148 x Self	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
B51243 x NCo310	36	—	36	—	—	—	—	8	—	8	16	—	16	12	36	—	36
B51244 x CL41/223	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
B51311 x Co270	11	—	11	—	—	—	—	—	—	—	11	—	11	—	11	—	11
B51355	815	—	815	10	—	10	—	268	—	268	266	—	266	264	798	—	798
B52298	322	—	322	1	—	1	—	105	—	105	114	—	114	102	321	—	321
B52371 x B45151	102	—	102	—	—	—	4	36	—	36	24	—	24	38	98	—	98
B52389 x B41211	127	—	127	3	—	3	1	48	—	48	44	—	44	31	123	—	123
B47324 x B4744	47	—	47	—	—	—	—	16	—	16	15	—	15	16	47	—	47
B47399 x B5862	9	—	9	—	—	—	—	—	—	—	9	—	9	—	9	—	9
B52389 x B41227	7	—	7	1	—	1	—	—	—	—	6	—	6	—	6	—	6
B5301 x Self	4	—	4	3	—	3	—	—	—	—	1	—	1	—	1	—	1
B53179 x B49119	24	—	24	1	—	1	—	8	—	8	15	—	15	—	23	—	23
B53200	10	—	10	—	—	—	—	—	—	—	10	—	10	—	10	—	10
B53267 x B45151	303	—	303	40	—	40	28	79	—	79	78	—	78	78	235	—	235
B53348 x B41211	668	720	1,388	109	24	133	77	156	300	456	170	396	566	156	482	696	1,178
B53348 x B49119	78	—	78	—	—	—	—	24	—	24	24	—	24	30	78	—	78
B53348 x Ebenei/37	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
B53355 x B49119	51	—	51	—	—	—	—	16	—	16	19	—	19	16	51	—	51
B54142 x Self	4	—	4	—	—	—	—	—	—	—	4	—	4	—	4	—	4
B54243 x Co331	2	—	2	—	—	—	—	—	—	—	2	—	2	—	2	—	2
B55258 x B39220	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
B5650 x B4747	47	—	47	7	—	7	—	12	—	12	16	—	16	12	40	—	40
B5651 x B45151	287	—	287	1	—	1	—	90	—	90	90	—	90	106	286	—	286
B5652 x B45151	420	—	420	12	—	12	2	130	—	130	144	—	144	132	406	—	406
B5652 x B49119	755	222	977	24	—	24	20	246	108	354	285	114	399	180	711	222	933
B56104 x B42231	22	—	22	6	—	6	—	8	—	8	8	—	8	—	16	—	16
B5862 x Self	2	—	2	—	—	—	—	—	—	—	2	—	2	—	2	—	2
J51 x B121	5	—	5	—	—	—	—	—	—	—	5	—	5	—	5	—	5
Barbados Cross No. 372	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
Co421 x B5451	735	282	1,017	96	—	96	25	198	144	342	204	138	342	212	614	282	896
Co421 x B5480	204	—	204	3	—	3	—	66	—	66	66	—	66	69	201	—	201
Co421 x B54163	418	—	418	51	—	51	18	114	—	114	114	—	114	121	349	—	349
D62/43 x B41227	6	—	6	—	—	—	—	—	—	—	6	—	6	—	6	—	6
D62/43 x NCo310	218	—	218	2	—	2	8	66	—	66	66	—	66	76	208	—	208
Eros x Self	210	—	210	3	—	3	—	66	—	66	75	—	75	66	207	—	207
F36/819 x B45151	232	—	232	3	—	3	1	72	—	72	90	—	90	66	228	—	228
F36/819 x B51134	4	—	4	1	—	1	—	—	—	—	3	—	3	—	3	—	3
H32/8560 x B42231	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
H32/8560 x B45151	718	—	718	12	—	12	43	222	—	222	219	—	219	222	663	—	663
H32/8560 x B4738	4	—	4	—	—	—	—	—	—	—	4	—	4	—	4	—	4
H32/8560 x B52298	315	—	315	—	—	—	3	105	—	105	117	—	117	90	312	—	312
H32/8560 x B5301	5	—	5	1	—	1	—	—	—	—	4	—	4	—	4	—	4
H32/8560 x B54142	150	—	150	—	—	—	3	48	—	48	51	—	51	48	147	—	147
H32/8560 x Co991	24	—	24	10	—	10	4	—	—	—	10	—	10	—	10	—	10
H32/8560 x Eros	333	—	333	18	—	18	1	90	—	90	131	—	131	93	314	—	314
Otaheite x B47199	50	—	50	—	—	—	—	16	—	16	18	—	18	16	50	—	50
Otaheite x B47331	6	—	6	1	—	1	—	—	—	—	5	—	5	—	5	—	5
PR1000 x B41227	158	—	158	3	—	3	—	48	—	48	48	—	48	59	155	—	155
PR1000 x B41276	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1
PR1000 x B49257	10	—	10	—	—	—	—	—	—	—	10	—	10	—	10	—	10
PR1000 x B50377	76	—	76	—	—	—	—	24	—	24	24	—	24	28	76	—	76
PR1000 x B51148	153	—	153	2	—	2	1	48	—	48	48	—	48	54	150	—	150
Trojan x B41227	99	—	99	2	—	2	1	36	—	36	36	—	36	24	96	—	96
Trojan x B44226	141	—	141	2	—	2	—	48	—	48	43	—	43	48	139	—	139
Trojan x B44227	287	—	287	3	—	3	—	93	—	93	101	—	101	90	284	—	284
Trojan x B49119	101	—	101	2	—	2	3	36	—	36	36	—	36	24	96	—	96
Trojan x Co290	158	—	158	1	—	1	6	48	—	48	55	—	55	48	151	—	151
Trojan x Pindar	195	—	195	2	—	2	2	66	—	66	59	—	59	66	191	—	191
B42231 x (P4)	238	—	238	36	—	36	8	66	—	66	66	—	66	62	194	—	194

TABLE LX—*continued*

Parentage	Potted			Died			MO	Transplanted										
								Frome			Innswood			J.S.E.	All nurseries			
	A	B	C	A	B	C		A	B	C	A	B	C	A	A	B	C	
B4738 x (P21)	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1	
B4738 x (P22)	2	—	2	—	—	—	1	—	—	—	1	—	1	—	1	—	1	
B4747 x (P6)	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1	
B5650 x (P1)	42	—	42	1	—	1	—	12	—	12	17	—	17	12	41	—	41	
B5650 x (P2)	40	—	40	6	—	6	—	12	—	12	10	—	10	12	34	—	34	
Co270 x (P9)	16	—	16	2	—	2	—	6	—	6	8	—	8	—	14	—	14	
Co331 x (P5)	2	—	2	—	—	—	—	—	—	—	2	—	2	—	2	—	2	
Co331 x (P12)	10	—	10	—	—	—	2	—	—	—	8	—	8	—	8	—	8	
Co331 x (P16)	13	—	13	4	—	4	—	—	—	—	9	—	9	—	9	—	9	
Co331 x (P17)	122	—	122	10	—	10	23	30	—	30	24	—	24	35	89	—	89	
Eros x (P11)	6	—	6	2	—	2	—	—	—	—	4	—	4	—	4	—	4	
Eros x (P18)	16	—	16	—	—	—	—	6	—	6	10	—	10	—	16	—	16	
Eros x (P26)	13	—	13	4	—	4	—	—	—	—	9	—	9	—	9	—	9	
B35269 x (P51)	12	—	12	1	—	1	—	—	—	—	11	—	11	—	11	—	11	
B37254 x (P42)	686	720	1,406	43	12	55	—	198	360	558	264	348	612	181	643	708	1,351	
B42231 x (P47)	512	—	512	4	—	4	—	156	—	156	195	—	195	157	508	—	508	
B4327 x (P52)	614	—	614	31	—	31	16	198	—	198	173	—	173	196	567	—	567	
B43234 x (P46)	2	—	2	—	—	—	—	—	—	—	2	—	2	—	2	—	2	
B43346 x (P55)	508	—	508	66	—	66	12	132	—	132	165	—	165	133	430	—	430	
B43349 x (P63)	17	—	17	—	—	—	2	6	—	6	9	—	9	—	15	—	15	
B43380 x (P77)	5	—	5	1	—	1	—	—	—	—	4	—	4	—	4	—	4	
B4409 x (P36)	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1	
B44226 x (P62)	158	—	158	1	—	1	1	52	—	52	48	—	48	56	156	—	156	
B4524 x (P68)	498	—	498	21	—	21	4	156	—	156	156	—	156	161	473	—	473	
B45105 x (P48)	19	—	19	—	—	—	—	6	—	6	13	—	13	—	19	—	19	
B45109 x (P35)	634	—	634	40	—	40	7	198	—	198	191	—	191	198	587	—	587	
B45119 x (P78)	11	—	11	—	—	—	—	—	—	—	11	—	11	—	11	—	11	
B45121 x (P64)	100	—	100	—	—	—	8	24	—	24	44	—	44	24	92	—	92	
B45266 x (P38)	693	—	693	10	—	10	10	222	—	222	229	—	229	222	673	—	673	
B4668 x (P56)	678	—	678	19	—	19	13	222	—	222	202	—	202	222	646	—	646	
B47157 x (P66)	250	—	250	1	—	1	5	81	—	81	72	—	72	91	244	—	244	
B47183 x (P75)	43	—	43	—	—	—	—	12	—	12	31	—	31	—	43	—	43	
B47184 x (P84)	630	—	630	34	—	34	14	198	—	198	186	—	186	198	582	—	582	
B47312 x (P40)	132	—	132	2	—	2	—	48	—	48	48	—	48	34	130	—	130	
B47380 x (P44)	416	—	416	9	—	9	51	114	—	114	128	—	128	114	356	—	356	
B48179 x (P49)	118	—	118	3	—	3	—	36	—	36	43	—	43	36	115	—	115	
B49119 x (P31)	233	—	233	3	—	3	—	66	—	66	98	—	98	66	230	—	230	
B49203 x (P30)	408	—	408	28	—	28	1	132	—	132	115	—	115	132	379	—	379	
B49374 x (P69)	1	—	1	—	—	—	—	—	—	—	1	—	1	—	1	—	1	
B49244 x (P58)	803	—	803	7	—	7	1	264	—	264	260	—	260	271	795	—	795	
B49388 x (P71)	29	—	29	4	—	4	—	12	—	12	13	—	13	—	25	—	25	
B5032 x (P43)	246	—	246	1	—	1	40	72	—	72	72	—	72	61	205	—	205	
B5055 x (P80)	54	—	54	4	—	4	—	16	—	16	18	—	18	16	50	—	50	
B50135 x (P59)	609	—	609	4	—	4	4	198	—	198	222	—	222	181	601	—	601	
B50382 x (P53)	411	—	411	11	—	11	3	132	—	132	132	—	132	133	397	—	397	
B5121 x (P39)	521	—	521	7	—	7	9	180	—	180	169	—	169	156	505	—	505	
B51148 x (P74)	629	894	1,523	21	30	51	1	198	420	618	198	444	642	211	607	864	1,471	
B51269 x (P79)	607	—	607	14	—	14	5	198	—	198	198	—	198	192	588	—	588	
B51311 x (P67)	159	—	159	1	—	1	5	48	—	48	48	—	48	57	153	—	153	
B52178 x (P32)	722	—	722	72	—	72	28	222	—	222	177	—	177	223	622	—	622	
B5301 x (P60)	799	—	799	36	—	36	—	222	—	222	312	—	312	229	763	—	763	
B5411 x (P45)	236	—	236	—	—	—	11	66	—	66	93	—	93	66	225	—	225	
B54243 x (P70)	15	—	15	—	—	—	—	6	—	6	9	—	9	—	15	—	15	
B57100 (P41)	40	—	40	2	—	2	—	12	—	12	14	—	14	12	38	—	38	
CP44/155 x (P50)	504	—	504	4	—	4	—	156	—	156	188	—	188	156	500	—	500	
CL41/223 x (P72)	392	—	392	6	—	6	8	132	—	132	132	—	132	114	378	—	378	
Co281 x (P57)	115	—	115	1	—	1	3	36	—	36	39	—	39	36	111	—	111	
Co413 x (P73)	90	—	90	3	—	3	—	24	—	24	39	—	39	24	87	—	87	
Eros x (P33)	712	—	712	90	—	90	4	198	—	198	222	—	222	198	618	—	618	
F31/962 x (P54)	616	—	616	182	—	182	7	132	—	132	162	—	162	133	427	—	427	
F36/819 x (P65)	2	—	2	—	—	—	—	—	—	—	2	—	2	—	2	—	2	
Trojan x (P61)	110	—	110	—	—	—	5	36	—	36	45	—	45	24	105	—	105	
Tukuyu No. 2 x (P37)	162	—	162	—	—	—	4	48	—	48	48	—	48	62	158	—	158	
Totals	34,623	4,746	39,369	1,915	174	2,089	687	10,535	2,082	12,617	11,365	2,490	13,855	10,115	32,015	4,572	36,587	

A = Singles. B = Bunches. C = Total MO = Mosaic.

G. ENTOMOLOGY

(i) Canefly (*Saccharosydne saccharivora* Westw.)

(*a*) *Investigations by the Commonwealth Institute of Biological Control*

Mr. F. D. Bennett prepared two reports on his canefly investigations at Monymusk and elsewhere, dealing with the periods November–December, 1959, and April, 1960. His findings and conclusions are given below.

(i) *Biological aspects.* It is clear that canefly is subject to certain natural population fluctuations, quite apart from those induced by the application of insecticides. At Monymusk infestations had fallen considerably from their August level and by April were low on all parts of the estate. Conversely, in a field of farmer's cane near Frome, the infestation which had been low in August, had built up again by December.

Natural enemies and climatic factors (separately and in combination) play an important part in population fluctuations. Eggs are frequently parasitised by *Anagrus armatus* Ashm. (Mymaridae) and a species of *Tetrastichus* (Eulophidae); the latter was very common at Monymusk in April and may have been responsible for the decline in infestation there. Nymphs and adults are parasitised by the Stylopid *Stenocranophilus quadratus* Pierce, which sometimes reaches 100% parasitism, or by *Pseudogonatopus* sp. and *Chalcognatopus* sp. (Dryinidae), which are frequent only when infestations are high. At Frome fungus diseases (*Metarhizium anisopliae* Sorokin, *Fusarium* sp. and *Hirsutella* sp. probably citriformis Speare) are considered responsible for the generally low infestations, especially during the wetter months. Besides these, there is a long list of predators, those particularly worthy of notice being *Chrysopa* spp. and *Zelus longipes* L.

The natural enemies of *Saccharosydne* throughout the Caribbean area have been listed and among them are several which do not occur in Jamaica, but could perhaps be introduced. From Venezuela *Oligosita* sp. (Trichogrammatidae), *Hesogramma basilare* (Wied.) (Syrphidae) and several *Chrysopa* spp., and from Barbados *Anagrus flavescens* Waterh. could be obtained. Parasites and predators of other Delphacidae should not be overlooked; in this connection *Cyrtorhinus mundulus* (Bredd.), the egg predator which controlled *Perkinsiella* in Hawaii, would be well worth trying. In fact one shipment of *Cyrtorhinus lividipennis* Reuter was sent from Fiji, but was held up by the U.S. Customs *en route*.

(ii) *The role of insecticides.* Two insecticides, Malathion and Endrin, have been used to great effect in the control of canefly, particularly where severe infestations have occurred on young cane. But there are very definite risks attached to the indiscriminate use of residual insecticides; the host/parasite and predator balance may be upset, insecticide resistance may build up, and there is a possibility that the use of insecticides may indefinitely prolong an outbreak. One cannot help wondering whether something of this nature has not already occurred at Caymanas, where chlorinated hydrocarbon insecticides have been used for some years. The impression gained from one morning's work was that *Stenocranophilus* and the egg parasites were very scarce, and it is also reputed that canefly has become resistant to DDT and BHC.

The effect of Malathion on the important canefly parasites was investigated at Monymusk. It killed the adult stages of *Anagrus* and *Tetrastichus*, but the immature stages in the canefly eggs were not affected. *Stenocranophilus* was eliminated along with the nymph and adult canefly. Even several months after spraying the effect of Malathion was very marked. In a comparison of sprayed and unsprayed fields the level of parasitism was lower in the former.

TABLE XLI

THE EFFECT OF MALATHION ON % PARASITISM

Species	% Parasitism	
	Sprayed	Unsprayed
Anagrus	5·92	11·74
Tetrastichus	30·47	57·89
Stenocranophilus	41·10	50·61
Pseudogonatopus	0·98	3·74

The successful block spraying trial at Tarentum raised the question whether any major upsets in the biological balance were likely to occur. A comparison of the status of the parasites in the area block sprayed and in fields individually sprayed showed that there was no cause for alarm.

TABLE XLII

THE EFFECT OF BLOCK *v.* INDIVIDUAL FIELD SPRAYING ON PARASITISM

Species	% Parasitism	
	Block sprayed	Individually sprayed
Anagrus	5·11	6·52
Tetrastichus	31·63	29·62
Stenocranophilus	28·57	43·61
Pseudogonatopus	No records	

The crucial question is therefore whether or not to spray. Is one to spray and take the risks, or wait and see if the infestation comes to a natural end? Of the insecticides that are effective against canefly, Malathion is undoubtedly the most suitable. Its short residual period minimises the effect on natural enemies, and is far less likely to induce resistance than a persistent insecticide such as Endrin.

In conclusion Mr. Bennett says: "The decision as to when spraying operations should commence must be an arbitrary one until more information on the causes of outbreaks becomes available; the benefits from eradicating a potential infestation and preventing a possible drop in yield should be balanced not only

against the costs of insecticidal application, but also against the dangers of producing an insecticide resistant strain, upsetting the biological balance, and prolonging an outbreak."

(*b*) *Insecticide trial*

A small trial was carried out at Monymusk in which a number of insecticides were compared with Malathion for their effect on canefly. The insecticides were applied by a motoblo mist sprayer in strips 1–½ chains wide across a field of plant cane 3 months old; each sprayed strip was separated by a control strip of the same width. The results were inconclusive because firstly, new nymphs were hatching every day, and secondly, adult canefly were moving between control and sprayed strips.

(ii) Investigations into soil Micro-fauna of cane-fields

In view of the increases in yield obtained at Worthy Park following soil treatments with Chlordane, four trials were laid down in 1959 to test this insecticide on a wider scale. The three treatments (0, 2 and 4 lb. Chlordane) were replicated five times. The insecticide was applied by knapsack sprayer before planting. Three of the trials were reaped; the fourth, at Rose Hall, was abandoned. None of the results was significant (see Table XLIII) although increases in yield were obtained at Bernard Lodge.

TABLE XLIII

Response to Soil Insecticides—TC/A (% Control)

Treatment	Estates and varieties		
	United Estates (B41227)	Frome (B4362)	Bernard Lodge (B42231)
Control	54·1 (100)	38·8 (100)	63·1 (100)
2 lb./acre	56·0 (104)	33·4 (86)	69·1 (110)
4 lb./acre	53·1 (98)	35·9 (92)	67·2 (106)

There is no doubt that soil insecticides under certain conditions produce economic increases in yield. It is unwise however, to draw any conclusions from these experiments until more is known of the life history and habits of the species which constitute the soil micro-fauna, and their susceptibility to Chlordane.

A preliminary examination of backward plant cane at Worthy Park revealed the presence of numerous small pits in the young shoot roots. Pits in the cortex down the length of the root apparently did little harm, but if the growing point was damaged further growth ceased and considerable distortion followed. Damage of this nature is most probably caused by small animals with biting mouth parts. So far, eleven species have been isolated from the soil; those which might be capable of making the pits include a Symphylid, a Collembolan and a small snail.

(iii) Survey of moth borer (*Diatraea saccharalis* (F.))

The last extensive survey of moth borer damage was made in 1954 when the average joint infestation for the island was 2·9. A small scale survey showed that in 1959 it had risen to 7·9, an increase of 174% over the 1954 figure. It was decided that a full scale survey should be made in 1960 in order to assess accurately the new status of mothborer.

About 10% of the cane fields in Jamaica were sampled during the 1960 crop. The method was exactly the same as that used in previous years, 100 whole canes being taken at random from each field just before reaping, and each cane split to ascertain the full extent of borer damage. No account was taken of rotten cane. The results are given in Table XLIV; the data are corrected for acreage and variety.

TABLE XLIV

% Joint Infestation, 1954–60

Estate	1954	1959	1960
Appleton	1·3	4·1	2·1
Barnett	0·8	—	3·8
Bernard Lodge	4·4	—	5·3
Caymanas	4·3	8·9	11·4
Frome	4·1	—	3·6
Gray's Inn Central ..	1·8	—	2·8
Hampden	4·3	—	4·6
Holland	3·5	—	4·2
Innswood	2·0	—	1·2
Jamaica Sugar Estates ..	2·2	—	2·5
Monymusk	3·9	—	10·0
New Yarmouth	1·6	—	3·9
Richmond/Llandovery ..	1·9	10·0	5·4
Rose Hall	4·7	13·7	9·6
Serge Island	0·8	3·0	1·9
Sevens	1·9	—	2·0
Trelawny Estates ..	4·3	7·6	4·4
United Estates	1·8	—	1·1
Worthy Park	5·1	—	3·1
Mean	2·9	7·9	5·4

It is clear that the intensity of mothborer damage is liable to fluctuations from year to year, and in 1960 it had fallen from the 1959 peak to 5·4, which is by most standards a light infestation. It is noteworthy that the 1958 growing season was unusually dry, and may well have been a factor contributing largely to the increased damage in 1959. Apart from these annual fluctuations, certain areas are particularly liable to heavy infestations, in particular Caymanas, Monymusk, Richmond/Llandovery and Rose Hall. The role of climate and parasites on moth borer intensity would be worth investigating on these estates.

Variety effects were confounded largely with estates but the data show that there is little to choose between the three leading varieties, B41227, B42231 and B4362, which had joint infestations of 5·1, 3·9 and 5·2, respectively.

There was a tendency, common to other territories, for fall plant cane to be more heavily infested than any other crop cycle.

(iv) Survey of rat damage

At the same time as the moth borer survey, separate account was taken of rat damage. This was very slight, only 0·04% joints being affected. This did not

take into account any canes that had been damaged earlier in the growing season and had since rotted. There was little difference between estates—Trelawny Estates had the highest infestation (0·09%), and four

TABLE XLV

JOINT INFESTATION (AVERAGED OVER ESTATES)

Cycle	Joint infestation
Fall plants ..	6·6
Spring plants ..	4·1
1st ratoon	5·0
2nd ratoon ..	4·2
3rd ratoon ..	3·9
Old canes	3·8

estates, Appleton, Holland, Innswood and Jamaica Sugar Estates, were lowest (0·01%). Differences between varieties were small and not important.

H. DEMONSTRATION PLOTS ON SMALL CANE FARMERS' HOLDINGS IN THE HILLY AREA OF UPPER CLARENDON

Much of the cane supply of Sevens and Worthy Park comes from the hill area of Upper Clarendon and is produced by small farmers and cultivators whose standards of land management and agriculture are low. At such levels of output per acre there will be a strong tendency to regard sugar cane as an unsatisfactory crop and to claim that the price earned per ton of cane is too low, whereas the real dissatisfaction should be directed at the levels of production. On much of these hill areas cultivation is not easy to mechanize, the land is often critically deficient in soil available phosphate and/or potash and the effects of erosion are often severe so that by comparison with lowland culture, especially under adequate natural rainfall, a comparable yield potential on the hills will be more expensive to achieve. In addition, reaping and loading present problems not encountered on lowland areas, whilst distances from factories are often at a maximum and road conditions some of the worst in the island. The impact of rising labour rates is also likely to have more lasting damaging effects on the agriculture of these areas than on lowland holdings.

The Department in co-operation with the Management of Sevens and Worthy Park and the local Cane Farmers' Associations laid out a series of demonstration plots on hill land in Upper Clarendon in order to show how yields might be improved by the use of optimum cultivation practices, fertilizers and the newer varieties.

Twenty holdings were included in the work, but wastage was high and demonstration plots were only reaped on ten. The manner in which the effort was received in the various districts was very encouraging, but the degree of supervision and persistency necessary to ensure success was very great. The experience gained suggests that the work was of value in stimulating interest, which was reflected in copying on the part of the operators of the land on which the plots were placed but that reliable estimates of the economics of improved agricultural methods will not emerge from such work. For the latter, a better method would probably be to build upon the results of agricultural economic surveys, whereby a carefully selected fraction of the farmers already covered by a survey are helped by general extension methods and the changed status of such "upgraded" farmers is compared with their former status and the status of other farmers when the survey is repeated. The work undertaken did demonstrate that cane and sugar yields can, on average, be raised in hill areas to levels approaching those on sugar estates and that this can be done economically. The work is being continued into ratoons.

Some interesting "side" information emerged from the work, e.g.

The mean relationship between loading and haulage rates and distance of haul was as follows:—

Miles	20	15	12	10	7·5	6·5
Rate per ton mile in shillings ..	0·75	0·93	0·94	1·0	1·33	1·52

During the year, on average, twenty-nine visits were required to each successful demonstration plot.

Most land operators hired labour and did not do any reaping themselves.

Many were unduly influenced by considerations of tonnage of cane and did not fully appreciate the impact of cane quality.

With one exception, cultivation was by hired cattle plough or by hand forking, which also, was generally hired. Whilst more than half the sites could have been cultivated by mechanized equipment, in two cases only was the area in cane large enough to attract a mechanized cultivation contractor.

All used sulphate of ammonia but none appreciated the importance of complete nutrition.

I. FACTORY DATA

The island average figures for pol % cane, Brix absolute juice and purity of the absolute juice have fallen in each successive year from 1956. Whilst the pol recovered in sugar % pol in cane has also shown a progressive downward trend, accompanied by increases in undetermined losses. Both these latter are to be expected if the quality of the cane milled falls. When an allowance is made for falling cane quality, it becomes apparent that the recovery of pol has been maintained.

Over the past 5 years estates have been called upon to grind an increasing quantity of cane, and 1,105,909 tons more cane were ground in 1960 compared with 1956 or an increase of over 34%. Cane farmers contributed a greater proportion of this larger tonnage than estates, and sugar manufacturers purchased more than 54% more cane from cane farmers in 1960 than in 1956. This has to a large extent, led to a considerable extension of the cropping period, and a number of factories, have had to continue operations in the uneconomic period. Throughput has been increased

from 61·4 tons cane per hour to 66·22, yet crop has taken on the average 32% longer. A higher proportion of possible grinding time was lost through non-factory causes. Despite all this and poorer juices as well,

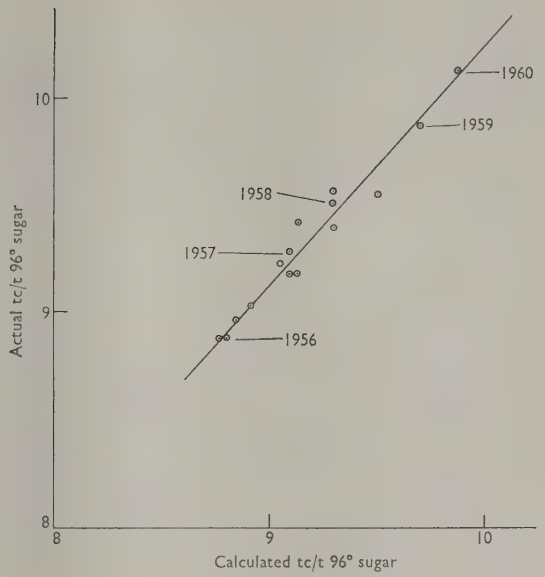


FIGURE 6

The relation between calculated* tons cane per ton 96° sugar and actual tons cane per ton 96° sugar for all Jamacia's sugar factories for the period 1946-60 inclusive.

*Calculated tc/t 96° sugar = reciprocal of 1.05 (Pol % Cane—2); see Follett. Smith, R. R., *1959 Proc. 10th Congress I.S.S.C.T., Hawaii*, page 354.

factory efficiency has been maintained at a high level, and the figures for reduced pol extraction x boiling house efficiency are as follows:—

1956	.. ..	92·9
1957	.. ..	92·1
1958	.. ..	92·6
1959	.. ..	91·9
1960	.. ..	91·3

The major factory change was the installation at Frome of a new, extra milling tandem and ancillary equipment such as extra gantry crane capacity, cane carriers, knives, boilers, rotary filter, juice heaters, evaporating vessels, vacuum pans, centrifugals, cooling tower, etc. The investment became necessary in order to bring back reaping to the period of optimum juices and to avoid the agricultural damage from late spring and early summer rains arising from the grinding of the greatly expanded production of the area. Factory Equipment Data also show the very considerable investment in new and extra equipment in the industry as a whole made during the year.

J. LIVESTOCK SCHEME

(A) Introduction and summary

1. In January the representatives of the Sugar Manufacturers' Association on the Livestock Development Committee submitted to the Parliamentary Secretary in the Ministry of Agriculture and Lands and to the Livestock Development Committee a comprehensive memorandum expressing their views on the terms of reference given the Livestock Development Committee by the Parliamentary Secretary.

2. Dr. Nestel in conjunction with Mr. Owen Clarke and the Director of Research has attended a number of meetings of the Government's Livestock Development Committee held during the year. Dr. Nestel and Mr. Clarke with the Chief Agricultural Economist in the Ministry of Agriculture and Lands formed a working party to study beef marketing. This Working Party reported to the main Livestock Development Committee in October.

3. On 26th and 27th January the Honourable Allan Isaacs, Parliamentary Secretary to the Ministry of Agriculture, accompanied by the Director of Research visited Frome, Barnett, Trelawny Estates, Worthy Park, Innswood and Caymanas in order to study livestock development on these six estates. A particular effort was made to stress the results of the cost accounting studies in progress on these estates, and also to emphasize the heavy capital costs of the land development projects which were observed. During the course of the two days the Parliamentary Secretary invited and received view-points of estate managers and of the staff of this department on the future of the livestock industry, and a number of frank and full discussions were held on all aspects of the industry.

4. Dr. D. Clay went on overseas leave in February, and in April whilst still in the U.K. tendered his resignation for personal reasons.

5. Dr. B. Nestel went on overseas leave in June. Whilst in the U.K. he attended the 8th International Grassland Congress held at Reading, and visited research centres in England. He also interviewed a number of applicants for the vacancy created by Dr. Clay's resignation.

6. Dr. M. J. Creek arrived in October to join the department as the third veterinary and livestock officer. Dr. Creek is stationed in Mandeville.

7. Miss G. N. King stenographer to the department for the past 2 years resigned to get married in June, and Mrs. P. Hudson who had been with the Livestock Department at its inception returned to it from the Sugar Research Department.

8. The most important event in livestock circles during the year was the complete decontrol of beef prices on 1st July. This resulted in a slight rise in the price of what was previously denoted as "prime" beef, and a sharp rise in the price of "control" beef. The

overall effect was to raise the average carcase value by about 30%. This increase was arrived at within a few weeks of decontrol. Overall returns rose slightly between July and December, although the value of fat steers decreased slightly as the differential between the best and the worst quality of beef narrowed to little more than 3d. per lb.

9. No fall army-worm caterpillars were recorded on Estate pastures, but one outbreak of sugar cane aphid was seen on pangola grass at Jamaica Sugar Estates. This was controlled biologically fairly rapidly, and only a few acres of grass were badly damaged.

10. No major disease problems were encountered. Overall mortality rates in estate herds remained at about 2½%, about half of which was due to baby calf deaths.

11. Favourable weather conditions resulted in a good year being had by beef farmers in most parts of the island.

12. The cost analysis survey was extended to cover eleven farms, which at the end of their 1960 year carried 10,446 head of cattle on 23,663 acres of grazing land. The results were published as a bulletin, extracts from which are presented.

13. A study was made of the relationship between weaning weight and 2-year-old weight and 2-year-old grade in Brahman heifers at Innswood and Caymanas. It was found that the weaning weight was very significantly correlated with the other two factors as a result of which it was suggested that most selection of the future breeding stock could be carried out at weaning time.

14. A series of eight hormone implantation experiments were completed and summarized as a bulletin which showed that implantation was an economic practice.

15. A second experiment was completed using tranquillizers at weaning time. This practice appears to be of no value.

16. The first calves sired by deep frozen semen were born. Conception rates were poor, but calf quality was outstanding.

17. Work with imported legumes has been curtailed, since the heavy fertilization of pangola grass appears to be the most profitable method of achieving high pasture protein outputs.

18. Two experiments were carried out with urea-molasses as a supplemental feed. Although this proved an economic practice, even before beef prices rose, it is possible that more intensive pasture management may prove a better method of ensuring adequate all the year round food intake.

19. A series of monthly beef marketing reports was commenced in September. The uncertain state of the market has resulted in the officers of the department devoting considerable time to marketing studies and to assisting estates to market their cattle. This work is being carried out in conjunction with the Division of Economics of the Ministry of Agriculture and Lands.

20. Shortage of staff during the year has curtailed work in some spheres, and the extension of fertilizer experiments on grass, and the analysis of the 1959 and 1960 weaning weights have fallen behind schedule.

(B) General observations

The early steps leading up to the freeing of beef prices from controls were outlined in the last annual report (p. 39). In that report it was noted that the S.M.A. representatives on the Livestock Development Committee had been unable to accept various decisions of that committee and they have since submitted to Government an independent memorandum. This memorandum was well received by the Ministry of Agriculture and some of its more important recommendations have since been acted upon.

During the year there have been numerous meetings of the Livestock Development Committee in order to discuss various subjects. Unfortunately, little positive progress appears to have been made except in the field of marketing where a comprehensive report was submitted in October by a Working Party consisting of Mr. Owen Clarke, Mr. A. M. Morgan Rees and Dr. B. L. Nestel. This report was subsequently submitted to the Ministry on a split vote, the S.M.A. and Civil Servant members of the Livestock Development Committee supporting it, and the Jamaica Livestock Association members opposing it.

In anticipation of an improvement in beef prices, steady progress has continued in both pasture improvement and herd expansion programmes. Fertilizer usage is expanding in an encouraging fashion and a few estates are now using levels of fertilizer similar to those used on Government farms.

Overall production as shown by the estates participating in the cost analysis survey rose by about 30% during the year. This rise was partially due to marketing bigger carcases and partially to increasing the turnover by improving calving and growth rates. The magnitude of the increase is probably due to the fact that 1960 was the first full year in which any estate began to farm grass intensively, and on the costed estates (containing over 50% of the Scheme's cattle) production from that 17% of their grazing land which is planted with pangola grass rose tremendously.

(C) Stock numbers

Table XLVI shows the number and distribution of the different categories of stock within the Scheme. Working stock continue to decline especially at Frome, and now only three estates have over 100 head of working steers. During the year, Caymanas and Innswood reduced their herds as a result of expanding their cane acreages. Beef cattle numbers continued to expand at Frome, Worthy Park, Trelawny, Jamaica Sugar Estates and Alumina Jamaica.

It would appear that the existing acreage of grazing and undeveloped land on estates could carry a substantially bigger herd if intensification continues to be

an attractive business proposition, and provided marketing problems can be surmounted.

(D) Cost analysis studies

The survey has now been enlarged to include eleven farms which have a total of 23,703 acres of grazing land which carried at the end of their financial year 1960, 10,446 head of beef cattle. In most cases it was possible to cost the new entrants to the survey for the year 1959 as well, so that some modifications have resulted in the averages quoted last year, and where comparisons with 1959 are given the 1959 figures are revised ones.

TABLE XLVI

NUMBER AND DISTRIBUTION OF DIFFERENT CATEGORIES OF ANIMALS

Estates	Horsekind	Working steers	Bulls (young and Service)	Breeding cows	Young males C—3 y.o.	Young females C—4 y.o.	Total
Alumina Jamaica	81	—	119	1,957	1,486	1,404	5,047
Appleton	70	12	1	29	29	15	156
Barnett	27	—	7	155	103	268	560
Caymanas	93	—	10	96	198	166	563
Frome	43	894	34	532	473	607	2,583
Gray's Inn Central	26	43	3	102	45	72	291
Hampden	34	—	6	123	108	171	442
Holland	34	27	6	205	176	171	619
Innswood	75	45	13	270	114	374	891
Jamaica Sugar Estates ..	76	128	6	170	133	246	759
Monymusk	231	—	3	69	4	22	329
Richmond/Llandovery ..	80	—	4	100	82	110	376
Serge Island	64	52	3	86	59	110	374
Sevens	61	2	4	83	23	41	214
Trelawny Estates	251	22	39	586	432	430	1,760
United Estates	117	167	43	1,383	303	555	2,568
Worthy Park	39	—	48	533	271	421	1,312
Total	1,402	1,392	349	6,479	4,039	5,183	18,844
Total 1959	1,792	1,968	380	6,361	4,110	4,982	19,593

Decontrol of beef prices

It may be as well to mention "decontrol" at this stage, because this factor has undoubtedly markedly altered the economics of beef production in Jamaica. Carcase prices which were completely controlled by law from 1940 to 1958, and thereafter partially controlled until June, 1960, became free of price control on 1st July, 1960. This resulted in an immediate and drastic price rise in the previously controlled portion of the market, and a slight rise in the previously decontrolled portion of the market. The net result was that fairly quickly the average carcase price rose from about 180s. per 100 lb. w.d.c. to about 240s.—a rise of 33%. When comparing outputs with 1959 it is therefore important to consider the impact of decontrol on the 1960 returns. In the main, this impact appears to be small in so far as most sugar estates close their books on 30th September, although one surveyed estate completed its financial year on 31st August, and one group of farms did not conclude theirs until 31st December. Most farms, therefore, had only two or three months benefit from decontrol during their 1959–60 year, and for much of this time the beef market was so uncertain that there was a limited amount of marketing done by many estates. The farms ending their year on 31st December benefitted from decontrol in a marked manner. Their sales for the period January to June, 1960, realized an average price of £46 12s. per head, whereas from July to December they averaged £65 16s. per head, giving a whole year average of £51 16s. At first glance it would appear that the price rose nearly 50% after decontrol, but a look at the whole year average reveals that decontrol has not had such a marked impact and that the high carcase prices in the latter part of the year are a result of marketing a limited number of choice cattle at peak prices during that period.

Another aspect of decontrol that must be mentioned is the request for an increase in labour rates that accompanied decontrol. Many sugar estates anticipated this at the time of the Goldenberg Commission which recommended a 12½% wage increase for sugar estate labourers. As a result of this some estates raised cattle pen wages by 12½% either early in 1960 or retroactive to the start of the 1960 crop year. Other estates decided to wait until decontrol and then make an independent wage increase. The overall effect is that most farms surveyed increased their wage rates by 10 to 12½% some time during their 1960 financial year. The impact of this varies from farm to farm, but on the group as a whole, it is certain that the full effect of these increases will not be felt until 1961.

Capital investment in the beef industry

Tables XLVII and L to LII show the capital structure of the surveyed farms.

Stock prices at the end of the year averaged £35·8 per head carried. This valuation is based upon the series of stock values decided upon in 1958, when these surveys commenced. Following on decontrol, carcase prices have risen by about 33% and the true market value of live cattle will probably have risen proportionately. The cattle population on the surveyed farms had an end-of-the-year valuation of £373,900—a rise of 33% on this represents a considerable gain. When prices become stabilized a realistic revaluation of cattle will be desirable.

TABLE XLVII

STOCK VALUATIONS

Opening		Closing	
No. of head	Average value per head	No. of head	Average value per head
9,946	£35·4	10,446	£35·8

TABLE XLVIII

ACREAGE OF VARIOUS TYPES OF GRASS

	Estate						
	1	2	3	4	5	6–11	Total
Pangola	122 (108)	166 (148)	431 (361)	342 (301)	993 (963)	2,008 (1,738)	4,062 (3,619)
Guinea and para	1,312 (1,392)	691 (709)	900 (900)	2,758 (2,758)	680 (680)	1,681 (1,681)	8,022 (8,120)
Wynne	—	—	—	—	—	1,476	1,476
Commons	109 (123)	8 (8)	1,496 (1,566)	2,878 (2,919)	754 (784)	4,898 (5,168)	10,143 (10,568)
Total	1,543 (1,623)	865 (865)	2,827 (2,827)	4,978 (4,978)	2,427 (2,427)	10,063 (10,063)	23,703 (23,783)
Acres per head	2·80 (2·85)	1·22 (1·12)	2·47 (2·27)	3·63 (3·94)	1·54	2·09 (2·20)	2·34* (2·54)*

* Weighted average.

Figures in brackets relate to 1959.

Most of the pangola is still undernourished, although two estates commenced an intensive fertilizer programme during the year.

If we assume fertilizer costs to be £15 per ton for both sulphate of ammonia and muriate of potash, and £35 per ton for triple superphosphate, the quantity of fertilizer going on to each acre of planted grass (pangola or wynne) in 1960 was as follows:—

TABLE XLIX

LB. FERTILIZER APPLIED PER ACRE DEVELOPED PASTURE IN 1960

	Estate					
	1	2	3	4	5	6
lb. N per acre	0	30	84	20	4	14
lb. P per acre	0	0	13	0	0	0
lb. K per acre	0	0	20	0	0	3

It would appear that only farms 3 and 6 (which will quadruple their application rate for 1961) have anywhere near a proper programme. Farm 5 with a capital of about £40,000 invested in pangola cannot expect, without fertilizer, to earn much more from pangola pastures of over 2 years standing than it would from the same land in unimproved grass. Both farms 3 and 6 which increased their fertilizer budgets markedly in 1960 made a profit for the year, whereas they made a loss in 1959

Land and fixtures

TABLE L

SUMMARY OF LAND VALUATION (TEN FARMS ONLY)

Acreage	Improved land value	Average value per acre	Average value per head	1959 average value per head
21,354	£656,294	£30·7*	£76·3*	£76·5*

* Weighted means.

TABLE LI

SUMMARY OF FIXTURE VALUATIONS (TEN FARMS ONLY)

Total value of fixtures	Average value per acre	Average value per head
£169,174	£7·9* (£9·06)	£19·6* (£20·1)

* Weighted average.

Figures in brackets relate to 1959

Total investment per stock head

Farms 3 and 4 are capitalized rather heavily as they were last year, but are both increasing their herds so that the previously suggested average investment figure of £125 per stock head still appears to be reasonably accurate. It will, of course rise if stock valuations are reconsidered as suggested earlier, in which case the final figure will be in the region of £140 per stock head.

New capital investment

Many more estates are now treating development as a capital expense rather than as current expenditure and all capital charges have been excluded from operating costs discussed here. New capital investment on the costed estates during the year was £24,500 or approximately £2 10s. per stock head, i.e. an increase of about 2% on the existing capital. It is noteworthy that this considerably exceeds the total profit made by the surveyed estates, this being only £1,439 or 0·1% on capital. Thus over £23,000 of outside money was put into the beef industry of this group of farms during the year.

These remarks when considered with the trend in fertilization seen above, suggest that a very large expansion of the beef industry may occur in the near future.

Operating costs

Table LIII shows the operating costs on eleven farms for both 1959 and 1960. The average cost per per stock head has fallen from £11·95 to £11·39. This appears to be due to an increase in stocking intensity, whilst certain costs such as depreciation and taxation have remained constant. Thus the per head cost for taxation and depreciation has fallen by £0·33.

TABLE LII

TOTAL INVESTMENT PER STOCK HEAD (TEN FARMS ONLY)

Investment per head	Estate 1	2	3	4	6–11	Weighted average	Weighted average, 1959
In land	£79·4	£64·5	£104·2	£79·9	£68·9	£76·3	(£76·5)
In fixtures	£17·9	£24·4	£16·0	£27·4	£17·7	£19·6	(£20·1)
In stock	£33·3	£37·9	£39·6	£35·4	£35·4	£35·8	(£35·5)
Total	£130·6	£126·8	£159·8	£142·7	£122·0	£131·7	(£132·1)
(1959)	(£130·5)	(£115·2)	(£152·3)	(£147·6)	(£125·8)	(£132·1)	

TABLE LIII

OPERATING COSTS IN £ PER STOCK HEAD

Item	Range	Mean of 11 farms	Mean of 9 farms	% of total operating costs
Labour				
Pasture cleaning	0·57–4·66	2·05	(2·12)	18 (18)
Fences and walls	0·36–2·05	0·73	(0·79)	6 (7)
Attending stock	0·65–2·88	1·63	(1·68)	14 (14)
Supervision	1·00–1·82	1·18	(1·03)	10 (9)
General	0·03–1·09	0·37	(0·54)	3 (5)
Sub-total	3·72–9·77	6·02	(6·16)	53 (52)
General				
Depreciation	0·21–1·91	1·06	(1·25)	9 (10)
Taxation	0·93–1·44	1·15	(1·29)	10 (11)
Administration	0·94–2·22	1·57	(1·56)	14 (13)
Sub-total	2·53–4·63	3·77	(4·09)	32 (34)
Tractor supplies				
	0·03–0·54	0·26	(0·57)	2 (5)
	0·54–2·72	1·43	(1·12)	13 (9)
Sub-total	0·67–3·05	1·69	(1·69)	15 (14)
Grand Total	8·52–14·98	11·49	(11·95)	100% (100%)

Labour costs

Labour costs continued to rise percentagewise and now represent 53% of operating costs, although on a per head basis there has been a slight fall from £6·16 to £6·02 per head.

Pasture cleaning

Pasture cleaning still represents the biggest item of labour costs and represents 18% of total costs. Overall cleaning costs per head are slightly better than in 1959, as although two estates have improved, one estate had an expensive year on pastures, and a new entrant is spending heavily in this sphere. The marked improvement in one estate following recommendations made in 1958 is noteworthy and a similar improvement in another estate should show up in 1961.

Fencing and wall-making

Fencing and wall making costs have been reduced again on the two heaviest spending estates, and the overall cost per head has again fallen, so that this charge now represents only 6% of total costs.

Stock attendance

Stock attendance still represents 14% of total costs and the charge per head is very similar to last year's. One estate has low charges under this head, and two have rather high charges here. On these three farms there appears to be scope for expansion in labour utilization.

Supervision

Supervision represents 10% of total costs—a rise of 1% over last year. Overseers are charged on the general overhead on some estates, and have therefore had to be allocated for out of the general charges. On this basis, an allocation of £1 per head as suggested last year appears to be rather low when compared with supervision charges on other estates. The increasing prosperity of the cattle business appears to be warranting a better class of supervision, the expense of which is rising accordingly.

Other labour charges

Other labour charges cover a number of items and only represent 3% of total costs.

General charges (32%)

This head once again involves a certain amount of allocation of charges. This has been discussed in previous years. The increase in stock numbers has caused a fall in per head taxation and depreciation charges, since taxation is a constant figure and depreciation only varies slightly unless a great deal of new capital investment occurs. Overall costs per head due to general charges have fallen by £0·33, i.e. from 34 to 32% of total costs. Part of this fall is due to one estate allocating rather too little under this heading. We have not yet valued this estate to assess a taxaton charge on it, whereas all other costed estates have a taxation charge based on the new land valuation law irrespective of whether or not they have been revalued. Thus year to year costs can be readily compared.

Tractor and supplies

Tractor costs are again very troublesome to allocate and some tractor charges may be found in other headings.

Supplies costs are beginning to rise due to fertilizer usage especially on two farms. Mineral and herbicide usage have also increased but charges for molasses are still very small. A large variation in dip costs still occurs. Supplies costs can be expected to rise markedly in 1961 as very much more fertilizer is being used.

Births

The overall calving percentage is about 73%. Estates 1, 2, 4*a* and 4*b* have again topped the 80% mark, and estates 3 and 4*c* have shown encouraging improvements which look like being even better in 1961. Estates 6 to 11 are, unlike 1 to 5 not running a severely restricted breeding season, and calculation of the calving rate is difficult, but they do not appear to be as productive of calves as are the farms on a strictly restricted season.

Deaths

Most farms had a mortality rate of 2 to 3%. No serious outbreaks of deaths occurred in recorded farms. Nearly 50% of the deaths were again in baby calves whose overall mortality lies in the region of 5%. A higher number of deaths than in 1959 occurred in breeding cows in 1960. On some farms animals are apparently being drafted to fattening herds too late in life, and they die in these herds whenever adverse grazing conditions are encountered.

Well planned culling should help to reduce adult cow mortality.

TABLE LIV

NUMBERS AND PERCENTAGES OF BIRTHS

Estate	No. of births		Calving %	
1	116	(128)	80%	(80%)
2	208	(202)	80%	(82%)
3	319	(320)	66%	(59%)
4*a*	119	(124)	84%	(84%)
4*b*	60	(55)	85%	(74%)
4*c*	169	(99)	66%	(50%)
5	391		70%	
6	31		74%	
7	428	(531)	64%	(72%)
8	70	(119)	48%	(67%)
9	288	(251)	57%	(74%)
10	127	(266)	79%	(69)
11	246		67%	

TABLE LV

MORTALITY STATISTICS

No. of deaths		% herd died		Value of deaths		Deaths as % herd value	
269	(203)	2·5%	(2·4%)	£6,560	(£5,335)	1·8%	(1·7%)

Purchases

The actual number purchased rose by ninety-one over last year, but the cost per head was similar at £39. Most purchases were fattening stock purchased early in the year to balance prime-control quotas, but two estates purchased commercial and appraised heifers at about £40 and £80 per head respectively. As with last year, the cost price was about 10% higher than the book value of the purchased stock.

TABLE LVI

PURCHASES

No. of animals		Cost		Average cost		Book value	
289	(198)	£11,258	(7,718)	£39	(£39)	£10,445	(£7,075)

All figures on brackets relate to 1959.

Miscellaneous receipts

Milk is produced by the pen on two estates. During the year estate 1 closed their dairy business and a special costing on estate 4 suggested that they should follow suit.

Other receipts include lumber (estates 1 and 2), hides and prizes (estate 2), and insurance claim (estate 5). On estate 2 most of the receipts are from agistment

(rental of land to the working herd). This is a most unsatisfactory system in that the pen stocking intensity is vastly increased for a portion of the year as a result of which periodic overgrazing occurs.

TABLE LVII

MISCELLANEOUS RECEIPTS

Estate	Receipts
1	£798
2	£1,160
3	£137
4	£218
5	£220
6–11	£56

Sales

A total of 2,123 head were sold for £108,898. The two estates with several individual farms carried out a number of internal transfers so that sales are considered as from six estates, some being several farms pooled together.

Butcher sales represented 66% of sales both by number and by value. This is a slight fall from last year, due mainly to the sale of a large consignment of breeding heifers to Venezuela which increased breeding stock sales up to 11% of the total by number and 16% by value. Store stock showed little change percentage-wise at 22% by number, but fell in value from 25 to 17% of sale income. Working stock constituted 1% of sales by number and by value.

Inter-estate comparisons are of limited value for breeding and store stock whose type and age can vary

TABLE LVIII

PERCENTAGE OF VARIOUS TYPES OF STOCK SOLD

Type of stock	Estate 1	2	3	4	5	6	Weighted average
Breeding	23 (1)	3 (16)	10 (9)	(1)	15 (10)	12 (2)	11% (5)
Butcher	77 (99)	48 (45)	60 (47)	100 (99)	85 (90)	60 (71)	66% (68)
Store	—	43 (18)	30 (43)	—	—	28 (27)	22% (24)
Working	—	6 (21)	—	—	—	—	1% (3)
	100%	100%	100%	100%	100%	100%	

TABLE LIX

PERCENTAGE OF INCOME FROM VARIOUS TYPES OF STOCK SOLD

Type of stock	Estate 1	2	3	4	5	6	Weighted average
Breeding	29 (4)	6 (18)	33 (25)	—	21 (25)	13 (2)	16 (10)
Butcher	71 (96)	56 (53)	45 (47)	100 (100)	79 (75)	65 (73)	66 (69)
Store	—	31 (16)	22 (28)	—	—	22 (25)	17 (24)
Working	—	7 (14)	—	—	—	—	1 (3)
	100%	100%	100%	100%	100%	100%	

TABLE LX

AVERAGE PRICE PER HEAD SOLD (£)

Type of stock	Estate 1	2	3	4	5	6	Weighted average
Breeding	59 (250)	77·8 (39·9)	190 (114)	— (100)	80·7 (140)	60·3 (37)	£80·8 (72·7)
Butcher	44·3 (46·4)	49·4 (42·6)	44·9 (42·5)	48·3 (38·1)	52·1 (45)	56·0 (41·6)	£51·5 (41·5)
Store	—	31·3 (33·0)	43·8 (28·0)	—	—	39·5 (37)	£37·7 (32·3)
Working	—	50·0 (23·0)	—	—	—	—	£50·0 (23·0)
Overall	£47·7 (47·9)	42·6 (36·3)	60 (42·7)	48·3 (38·1)	56·3 (54·2)	51·8 (40·3)	£51·3 (40·6)

widely. For butcher stock there is a range in average price of £44·3 to £56·0 between estates. The lowest price is from an estate whose lands do not fatten well, and where a policy of enlarging the breeding herd and marketing larger numbers of smallish stock appears to be the most profitable approach. Estate 3 is butchering mainly fat cows and selling steers as stores, hence its average price for butcher stock is also low. Estate 6 as noted earlier, ended its financial year in December and benefitted the most from decontrol, so that its average price was the highest. Bearing these points in mind, the variation in average price of butcher stock is not large.

The average price per stock head sold rose by 26% from £40·6 per head to £51·3 per head. This is closely paralleled by the rise in average price of butcher stock which has averaged 24%. Breeding stock sales have risen less because of the high percentage of heifer outputs from farm to farm, particularly in farms 6 to 11 which exchanged a number of stock at book values. The average gross output of this group taken as a single unit is similar to the mean of the other farms.

The worst farms, numbers 7, 8 and 9, carried out mainly breeding, and sold off or transferred (at a calf book value of £15) many weaners. By valuating weaners at £30 the gross outputs from these farms would have been more realistic.

The best figures were from farms 2, 6 and 10. Numbers 6 and 10 purchased or "transferred in" weaners and stores and fattened them. Number 2 bred weaners on good intensively farmed land.

These returns suggest that fattening on good land as carried out by farms 6 and 10 is highly profitable. For farm 6, even when costing "transfers in" at market values, the profit per head carried was £17, and that

TABLE LXI

GROSS OUTPUT PER STOCK HEAD (£)

	Estate											
	1	2	3	4	5	6	7	8	9	10	11	Mean
Gross output per stock head	10·86	19·63	13·0	10·71	11·77	23·77	7·43	4·71	8·69	18·88	9·68	12·65
	(9·87)	(9·93)	(9·05)	(6·66)	(9·71)			12·19 / 8·76				(8·85)

sales in this category. Working stock prices have risen somewhat because the 1959 working stock sales were for immature animals. Store stock prices have risen only 17%. The store market is in an unhealthy state due to lack of competition and store prices are unattractive to the breeder because of a reluctance of farmers to enter the fattening business.

It is estimated—

(*a*) that not more than 25% of sales were made under complete decontrol; and

(*b*) that the effect of decontrol raised the average value per 100 lb. of beef by 33%.

Thus only about 10% rise in carcase prices over the 1959 level was a direct result of the decontrol price rise. The remainder of the rise in butcher stock price was a result of marketing bigger animals, especially those classified as "prime" in the controlled price era'

Gross outputs

The gross output = sales less purchases ± change in herd valuation over the year. The total gross output of the costed estates was £121,636. Their total absolute sales was only £108,898 so that the residue of the gross output was in the form of an increase in stock values.

The mean gross output per head rose from £8·85 to £12·65. Allowing for a 10% increase due to decontrol, there is an additional increase in gross output of 30% during the year. There is a fairly wide range in gross per acre was £7. With heavy fertilization and intensive farming this profit could probably be markedly increased.

Estate 2 with good land and a high stocking density and calving rate is achieving a high gross output from breeding and selling stores. The evidence from farms 6 to 11 suggests that estate 2 could make very much more profit if it fattened instead of bred.

Net turnover as % of herd size

This is defined as Sales less purchases + annual change in herd size × 100% mean herd size. It is a complex indicator of productivity since it takes into account birth rate, death rate and the rate of growth of young stock. There has been an increase in net turnover from 21·2% in 1959 to 23·1% in 1960. Estate 1 has a lower turnover due to stock carry overs. In order to see to what extent this estate has affected the average, we have calculated a weighted average which comes to 22·8%.

The estates with a big store trade, and hence large breeding herds (2 and 3) have a somewhat higher turnover than the average.

It is difficult to predict the turnover of this industry as a whole from these figures, since the costed pens probably have a higher birth rate and a better growth rate than the average pen. The effect of the store trade is also difficult to assess since the fattener will have similar sales and purchases, and therefore a low net turnover on the above formula.

Stocking density

The increase in stock numbers has resulted in a slight fall in the land area per stock head, so that the total cattle population of the costed estates now graze about 2·3 acres per stock head instead of 2·5 acres as for last year.

Gross output per £100 spent on labour varies widely and averages £234 for the eleven farms of £188 on a weighted average. This is a low return compared with other countries and other types of West Indian farming. On several farms (1, 4, 5 and 7) the gross output barely covers the labour costs. All farms do, however, show a marked improvement over the previous year (in brackets).

TABLE LXII

NET TURNOVER AS % OF HERD SIZE

	Estates						Mean	Weighted average
	1	2	3	4	5	6		
Net turnover	16·7 (20·2)	27·8 (24·3)	25·3 (19·9)	24·0 (18·4)	23·6 —	21·5 (23·2)	23·1 (21·2)	22·8

TABLE LXIII

STOCKING DENSITY

	Estate						Mean	Weighted average
	1	2	3	4	5	6		
Acres per head	2·80 (2·85)	1·22 (1·12)	2·41 (2·27)	3·63 (3·94)	1·54 —	2·09 (2·20)	2·28 (2·48)	2·34 (2·54)

TABLE LXIV

SOME ASPECTS OF LABOUR COSTS

Item	Estate											Mean	Weighted average
	1	2	3	4	5	6	7	8	9	10	11		
Labout costs (£) per head	9·77	3·87	6·30	8·54	9·45	5·0	4·8	5·3	3·7	4·8	4·6	6·02	6·34
Labour as % operating costs	69%	42%	46%	57%	67%	53%	50%	50%	44%	43%	48%	52%	53%
Gross output per £100 labour costs ..	£113	£505	£208	£125	£125	£477	£155	£89	£233	£334	£209	£234	£188
						£236							
	(79)	(264)	(188)	(74)	(105)	(£195)						(160)	
Margin per head of gross output over labour costs	£1·1	£15·76	£6·7	£2·2	£2·3	£18·8	£2·6	−£0·6	+£5	£14	£5·1	£6·6	£5·59
						£6·3							
	(−2·7)	(6·17)	(4·2)	(−2·3)	(0·4)	(4·3)						(1·7)	

The importance of labour costs

Labour costs per head average £6·02 per farm or £6·34 on a weighted average basis. They differ from the means by over 30% on five farms. On numbers 1, 4 and 5 this difference is on the high side, and in all three cases pasture cleaning and fencing costs, particularly the former, are very high. On farms 2 and 9, labour costs are very low. On both farms it would probably be profitable to spend more on pasture maintenance in order to achieve higher outputs.

Labour costs average 52% of operating costs, most farms falling in the range 47 to 57%. Farms 1 and 5 have disproportionately high labour costs because of the cleaning and fencing charges noted above. Farms 2 and 9 have labour as a below average proportion of costs, since labour costs are low on both farms. Farm 10 has high fertilizer costs which make labour costs low on a percentage basis.

The final line of the table shows the margin per head of gross output over labour costs.

The profitability of farms 2, 6 and 10 has already been noted. Only farm 8 (a breeding farm transferring weaners at a book value) did not produce more than its labour cost. The mean margin between the two items, gross output and labour cost, rose from £1·7 to £6·6. On a weighted basis this margin was £5·6 per head.

Gross output per £100 operating cost

This table shows at a glance the relationship between input costs and output returns. £100 represents a break even point. The weighted average shows that the whole group is making a very small profit. Farms 2, 6 and 10 as noted earlier are making substantial

profits on turnover. All farms have improved over the previous year.

Profit and loss

This table expresses profit or loss on a per stock head basis. Farms 6 to 11 are treated as one to give an accurate final picture. For this reason the weighted average margin may be of more value than the mean margin of all farms. In either case a 1959 loss has been turned into a very small profit per stock head.

this, in future cost reports we will have to consider using the term net output, in which feed and fertilizer used to produce are deducted from gross output to give net output. On most farms there is still little difference between gross and net outputs as shown below.

There is already a suggestion that the marked increase in fertilizer usage may have played a large part in increasing the gross output of the costed farms in 1960. It will not be difficult to see whether this trend

TABLE LXV

GROSS OUTPUT PER £100 OPERATING COSTS

Item	Estate 1	2	3	4	5	6	7	8	9	10	11	Mean	Weighted average
Gross output per £100 operating cost	£77	£212	£97	£72	£83	£252	£77	£44	£102	£167	£101	£117	£101
	(35)	(99)	(81)	(44)	(68)			£114 (93·2)					

TABLE LXVI

PROFIT AND LOSS

Item	Estate 1	2	3	4	5	6	7	8	9	10	11	Mean	Weighted average
Gross output per head (£)	10·9	19·63	13·0	10·71	11·77	23·8	7·4	4·7	8·7	18·9	9·7	12·65	11·93
	(10·9)	(9·93)	(9·0)	(6·66)	(9·71)				10·9 8·76				(8·54)
Operating cost per head (£)	14·2 (17·3)	9·25 (10·00)	13·53 (11·18)	14·98 (15·21)	14·11 (14·23)				9·78 (9·40)			11·39 (11·95)	−11·79
Margin per head gross output over operating cost (£)	−3·3 (−6·6)	10·38 (−0·07)	−0·5 (−2·1)	−4·3 (−8·5)	−2·34 (−4·5)				+1·1 (−0·6)			+1·26 (−3·1)	+0·14

TABLE LXVII

NET OUTPUTS EXPRESSED IN £ PER STOCK HEAD

	Estate 1	2	3	4	5	6	7	8	9	10	11
Gross output	10·9	19·6	13·0	10·71	11·8	23·8	7·4	4·7	8·7	18·9	9·7
Fertilizer, feed mineral and molasses costs	0·1	0·4	2·8	0·6	0·7	0·0	0·5	0·7	0·4	1·6	0·3
Net output	10·8	19·2	11·2	10·1	11·1	23·8	6·9	4·0	8·3	17·3	9·4

As a group the farms studied made a total profit of £1,439, whereas they lost £27,645 the previous year. Only about £8,500 of the improvement in position can be attributed to the decontrol of beef prices. The residue represents an increase in productivity during the year of about 30% and has been achieved without increasing operating costs.

Intensification and outputs

With the advent of intensification in beef cattle farming, it is probable that gross outputs will no longer be the best indicator of production in that high outputs will necessitate high input costs. In order to allow for

continues during 1961 when very much heavier fertilizer usage is anticipated.

(E) Animal growth studies

Weaning weights

Weaning weights were again recorded at Caymanas, Innswood, Barnett, Worthy Park and Trelawny Estates. Staff shortages held up progress with this work, but it is hoped to complete the returns for 1959 and 1960 by June, 1961. The volume and type of data available are suitable for analysis on an IBM computator and it is hoped to process the data for the 2 years on such a machine.

Post-weaning gain in heifers

A study was made of the relationship between weaning weight, 2-year-old weight and 2-year-old grade of Brahman heifer calves at Caymanas and Innswood (Tables LXVIII and LXIX respectively). In each case the corrected final weight was plotted against the rate of gain to weaning and the results (Figures 7 and 8) showed a straight line relationship between the rate of gain to weaning and corrected final weight.

Thus all of the animals with a low rate of gain to weaning appear at the bottom end of the line and similarly have a low final weight. As the figure for

TABLE LXVIII

CAYMANAS HEIFERS, 1959 CROP

Brand No.	Rate of gain to weaning (lb./day)	Rate of gain from weaning to 17.1.61 (lb./day)	Final weight (lb.)	Final weight corrected to 714 days (lb.)	Final grade	Mean points plotted on Figure 7
1/9	2·07	0·725	768	807·8	1	
86/9	1·98	0·78	870	877	1	Rate of gain to weaning (R.O.G.) 1·89
244/9	1·85	0·615	670	705·7	3	
32/9	1·78	0·72	700	709·4	2	
17/9	1·77	0·60	714	714	2	Corrected final weight (C.F.W.) 763
8/9	1·65	0·79	769	784	1	
150/9	1·64	0·775	762	775·2	2	R.O.G. 1·62
206/9	1·63	0·85	770	789·6	1	
119/9	1·62	0·58	612	646·2	4	
29/9	1·57	0·77	700	743·9	2	C.F.W. 748
53/9	1·55	0·56	729	705·4	1	
19/9	1·53	0·48	641	663·6	6	R.O.G. 1·51
43/9	1·52	0·64	672	682·6	3	
138/9	1·50	0·5	735	729·5	2	
108/9	1·46	1·68	690	730·8	3	C.F.W. 702
31/9	1·44	0·52	686	663·1	3	
6/9	1·42	0·635	704	687·5	3	R.O.G. 1·41
91/9	1·41	0·47	580	582·8	5	
50/9	1·41	0·76	721	729·4	2	
136/9	1·40	0·80	735	745·4	3	C.F.W. 682
103/9	1·35	0·56	651	638·7	3	
23/9	1·35	0·635	655	672·8	3	R.O.G. 1·33
65/9	1·34	0·675	720	695·7	3	
144/9	1·30	0·53	636	615·9	4	
44/9	1·30	0·58	688	656·1	4	C.F.W. 656
250/9	1·23	0·575	616	639	3	
80/9	1·22	0·575	644	621	4	R.O.G. 1·21
33/9	1·22	0·675	636	644·8	5	
30/9	1·21	0·535	623	632·1	4	
24/9	1·19	0·78	703	698·3	2	C.F.W. 647
106/9	1·18	0·925	730	755	2	
55/9	1·15	0·505	563	555·9	5	R.O.G. 1·15
158/9	1·15	0·675	658	642·9	3	
115/9	1·15	0·72	640	652·2	4	
38/9	1·1	0·54	582	572·8	5	C.F.W. 626
106/9	1·1	0·64	606	615·6	4	
48/9	1·09	0·675	682	653	4	R.O.G. 1·09
71/9	1·09	0·69	654	629·8	3	
28/9	1·08	0·63	650	624·2	6	
52/9	1·06	0·68	622	629·5	3	C.F.W. 630
13/9	1·05	0·655	658	662·6	3	
81/9	1·05	0·72	634	662·8	5	R.O.G. 1·00
78/9	1·00	0·65	621	602·8	6	
36/9	0·97	0·61	658	583·4	4	
57/9	0·94	0·75	613	646	4	C.F.W. 631
148/9	0·92	0·71	671	634·8	3	R.O.G. 0·84
61/9	0·91	0·69	520	547·6	6	
27/9	0·85	0·69	635	596·4	4	
61/9	0·67	0·415	520	468·1	6	C.F.W. 582

rate of gain to weaning increased so did the final weight. Statistically there was a correlation, significant to a very high degree between the rate of gain to weaning and corrected final weight, also between rate of gain to weaning and grade. In other words, the animals most suited to breeding could have been picked out 12 to 14 months earlier.

brought in in groups of two or three and placed in one of six categories which had been decided upon in the initial survey. Factors taken into account were those relating only to the production of beef (girth, shape of hind quarters, proportion of good cuts, back line, etc.) *not* to any breed requirements. Thirdly, the animals were again surveyed in different groups, and the grades

TABLE LXIX

INNSWOOD HEIFERS, 1959 CROP

Brand No.	Rate of gain to weaning (lb./day)	Rate of gain from weaning to 6.3.61 (lb./day)	Final weight (lb.)	Final weight corrected to 772 days (lb.)	Mean points plotted on Figure 8
62/9	1·95	0·47	675	668	
129/9	1·86	0·59	790	761	R.O.G. 1·87
84/9	1·86	0·61	720	719	
30/9	1·85	0·59	700	702	
34/9	1·84	0·475	650	679	C.F.W. 705
12/9	1·79	0·609	670	680	
89/9	1·79	0·506	705	685	R.O.G. 1·76
80/9	1·76	0·415	630	620	
35/9	1·74	0·48	670	654	
71/9	1·72	0·5	675	655	C.F.W. 659
37/9	1·71	0·46	645	631	
18/9	1·71	0·53	640	642	R.O.G. 1·68
51/9	1·69	0·38	610	625	
103/9	1·67	0·36	560	595	
82/9	1·63	0·57	600	665	C.F.W. 631
101/9	1·63	0·55	660	652	
104/9	1·60	1·69	685	677	R.O.G. 1·57
17/9	1·56	0·49	660	642	
19/9	1·55	0·42	640	616	
21/9	1·54	0·47	640	621	C.F.W. 641
124/9	1·54	0·47	590	620	
47/9	1·52	0·48	570	575	R.O.G. 1·52
85/9	1·52	0·57	680	700	
24/9	1·52	0·53	600	606	
139/9	1·51	0·38	550	571	C.F.W. 614
31/9	1·48	0·55	585	600	
115/9	1·47	0·479	590	583	R.O.G. 1·43
112/9	1·44	0·50	605	595	
44/9	1·39	0·48	640	614	
137/9	1·37	0·54	620	614	C.F.W. 601
24/9	1·36	0·52	600	593	
86/9	1·32	0·56	620	614	R.O.G. 1·31
131/9	1·32	0·448	580	565	
17/9	1·32	0·688	540	594	
95/9	1·2	0·248	500	488	C.F.W. 571

As final weight was taken for animals of differing ages, these were made comparable by correcting them to 714 days; this was the mean age of the group, the standard deviation of which was 40 days. In other words, in the majority of cases the correction was less than 6 weeks. In order to correct the final weight a linear rate of gain was assumed over this period.

The animals were graded in three operations. First, the whole group was surveyed to assess the varying standards of animal. Secondly, the animals were previously allotted were adjusted if any anomalies were seen to exist in the initial grading. This grading is noted as final grade, and was arrived at before the animals were weighed.

The correlations of final weight, corrected final weight and grade each on rate of gain from birth to weaning were statistically significant to well beyond the 1% level of probability. The correlation coefficient (r) in the first two cases can be seen to be significant at the 0·1% level ($r = 0{\cdot}78$, and $r = 0{\cdot}77$). However,

an analysis of the relationship between the rate of gain from weaning and the rate of gain to weaning showed that no correlation existed at all. On the surface this seems to contradict that there should be any relationship between rate of gain to weaning and the final weight, until it is realized that in fact, the weaning weight amounts to between $\frac{2}{3}$ and $\frac{3}{4}$ of the final weight in these circumstances.

The mean age of the heifer crop at Innswood was 772 days at the time of weighing on 6.3.61. Final weights were adjusted to this. The grading of animals into six groups was not attempted.

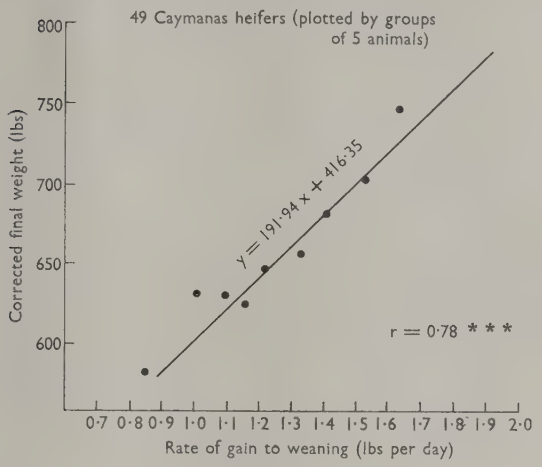

49 Caymanas heifers (plotted by groups of 5 animals)
Corrected final weight (lbs)
800
750
700
650
600
y = 191·94 x + 416·35
r = 0·78 * * *
0·7 0·8 0·9 1·0 1·1 1·2 1·3 1·4 1·5 1·6 1·7 1·8 1·9 2·0
Rate of gain to weaning (lbs per day)

FIGURE 7

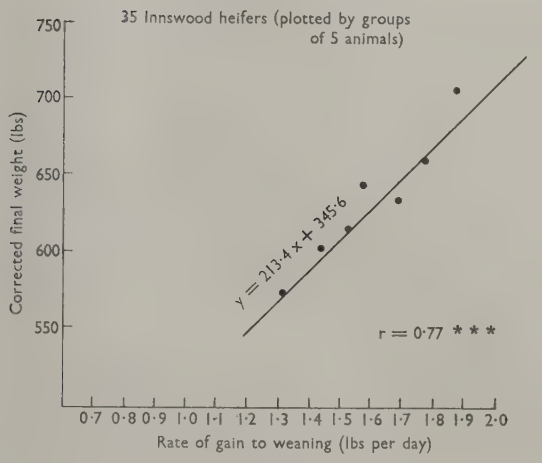

35 Innswood heifers (plotted by groups of 5 animals)
Corrected final weight (lbs)
750
700
650
600
550
y = 213·4 x + 345·6
r = 0·77 * * *
0·7 0·8 0·9 1·0 1·1 1·2 1·3 1·4 1·5 1·6 1·7 1·8 1·9 2·0
Rate of gain to weaning (lbs per day)

FIGURE 8

Many refinements can be suggested to make such a study reveal much more information. The importance of this concept in the modern treatment of beef cattle must be understood in order to make best use of an estate herd. The majority of estates have a certain percentage of their pastures as pangola grass, while the greater proportion is unimproved commons, guinea or para grass. Again the majority of estates run the breeding herds on free range, while steers and culled heifers are grazed intensively, mainly on pangola. This system tends to work smoothly, giving the breeding herd a certain amount of hardiness while fattening the steers quickly. The rate of gain prior to weaning could be more accurately assessed with two or three weighings initially, obviating the error of an assumed birthweight, and allowing the influence of birthweight to be isolated and examined.

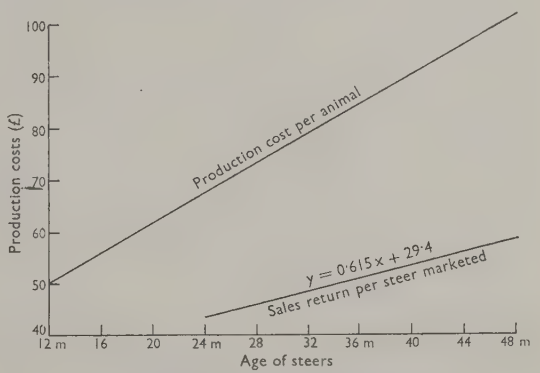
The technique of grading leaves much room for improvement. The idea of grading in addition to weighing serves two purposes—

(i) it acts as a barrier to prevent animals with undesirable abnormalities from being automatically selected because they have a good weight; and

(ii) it brings additional pressure to bear to bring about improvement in addition to weight.

Outstanding animals will never be missed, but this will be an additional aid in determining which of the relatively equal animals to choose for breeding.

Thus in concept, weight should play no part in the choosing of a grade for an animal. Although this was attempted with the heifers examined at Caymanas, the very high correlation which exists between final weight and grade suggests that, in the absence of a more refined method of grading, it cannot be assumed that weight did not influence the grader.



Relationship of production cost and sales returns to animal size

FIGURE 9

Slaughter age and slaughter weight

A study was made of the relationship between slaughter age and slaughter weight of steers on one estate. The existing sales returns were such that the older the animal was, the greater was the loss on its sale. When operating costs were divided equally among all categories of stock and estimated operating cost per month was plotted against the regression line, the two lines diverged with increasing age (Figure 9).

As a result of this, the estate was advised to butcher stock at a younger age, if such stock was not fully finished. This apprach can probably be successfully adopted by other estates whose cattle lands are marginal and where fattening is difficult. If and when a proper store market develops, it would obviously pay such estates not to attempt to fatten.

(F) Artificial insemination

Reference was made last year to the importation of deep frozen semen from the U.S.A. in December, 1959. During 1960, eighty-five doses of this semen were used on Brahman cattle, and a few calves were born in the latter part of the year.

There were a number of practical difficulties in operating the insemination programme. Most of these were connected with getting the labour to co-operate in a programme that involved much extra handling of fractious heifers. In addition, difficulties were experienced in observing "heats" and many repeat heats were missed. The act of insemination was difficult in a few very wild heifers, but as a rule, with the crush facilities available, the inseminators were able to operate without too much inconvenience.

The overall results were poor; the conception rate to first service is unlikely to be much more than 20%—under a third of the figure achieved with dairy stock. It is probable that a rate similar to that in dairy cattle could be achieved, but the first and most vital step towards this is better labour co-operation.

The expense of a deep freeze unit, and the need for a trained inseminator mean that A.I., using frozen semen is only practical at the present time in the vicinity of Bodles. Exciting new developments in the field of anti-fertility chemicals particularly with synthetic analogues of the natural hormone progesterone may completely revolutionize A.I. in beef cattle in the future. These new compounds may make it practicable to produce coincident oestrus in large numbers of cattle so that it may be possible to hire an inseminator and his equipment for a few days during the course of which a whole herd may be inseminated. This possibility is already being exploited experimentally abroad. It suggests that at the present time it would be unwise for any estate to invest in A.I. equipment and training of personnel. It would almost make importation of bulls unneccessary were widespread A.I. successful. This would result in tremendous trides being possible in both pure and cross breeding. Some of the calves born to deep frozen semen already show considerable early promise.

(G) Hormone implantation

A very large number of feed additives have been tested for livestock use in recent years. A number of these additives have been found to be of considerable value and are used as a standard part of some livestock rations. The application of such additives to livestock production in Jamaica is somewhat limited by the fact that concentrate feeding is not standard practice for beef cattle. However, some of the additives have been shown to be of value when administered to the animal by injection. Two such additives with a potential application in beef cattle farming in Jamaica are tranquilizers and hormones. During the past 3 years a number of trials have been carried out with these two products on cattle belonging to members of the Livestock Scheme.

Experiments were designed to study:—

(i) the relative merits of hexoestrol and implant A;

(ii) the optimum dose of hexoestrol;

(iii) the effect of implantation on the dressing percentage of the carcase;

(iv) whether there was any interaction between breed type (pure Brahman, high grade European and hybrid) and hormone response;

(v) whether the response was the same when animals of various sizes were implanted; and

(vi) whether the plane of nutrition affected hormone response.

Steers were allocated to groups according to a stratified random scheme which balanced groups according to liveweight. In experiments 4 and 6, groups were also balanced according to breed, and in these experiments steer pairs were analysed as blocks. All steers were acclimatized to their trial environment by grazing on it for at least 3 days prior to being weighed on to the experiment. Weighings were thereafter carried out monthly in the mornings without overnight starvation. Starved weights were obtained prior to slaughter in experiments 2 and 4.

Hexoestrol (60 mg.) and liveweight

In five experiments (numbers 2, 4, 5, 6 and 7) the dosage used was 60 mg. of hexoestrol. In all of them the implanted group gained more in liveweight than the control steers did during the treatment period. In experiments 4 and 5 this increase was significant at the 1% level of probability, and in experiment 6 it was significant at the 0·1% level. In experiments 2 and 7 the implanted steers gained 20 and 25% respectively more than their untreated partners. It is probably due to the fact that the design of these two experiments did not permit of pairing to reduce variation for sizes and types of steers, that these last two results were not statistically significant. Table LXX displays a summary of the responses to hexoestrol treatment.

In experiment 6 the steers rotationally grazed a series of lush pangola pastures and it was possible to carry out a series of monthly weighings during this experiment in order to follow the rapidity of the response to implanted hexoestrol. It appeared that the response was apparent within 28 days and persisted for at least 84 days. Table LXXI shows this.

Dosage of hexoestrol

Experiment 8 was designed to test the effect of different dosage levels of hexoestrol on the subsequent gains of grazing hybrids. There was little difference

between the responses of the groups receiving 30, 45 and 60 mg. hexoestrol. The animals were assigned to treatments in groups of fourteen and not allocated in blocks and the large within-treatment variation was again the probable explanation of the lack of a significant response. The 30 mg. dose produced the least side effects and the results suggest that this dose is adequate.

Dressing percentage

In experiments 2, 3 and 4, full and starved farm weights were obtained prior to slaughter. In experiment 4, data were available for only a random nineteen of the steers slaughtered. In the other two trials all steers were slaughtered. In all three groups the implanted steers dressed at a slightly lower percentage on an empty farm weight, although in only one case did the treated group dress lower on a "full" basis. It would therefore appear as if there was a slightly greater loss of fill prior to slaughter in implanted steers.

There was no apparent difference in the nature of the dressing percentages between the two types of hormone implants.

TABLE LXX

The Effects of Implants of 60 mg. Hexoestrol on the Liveweight Gains of Grazing Beef Steers

	Experiment 2		Experiment 4		Experiment 5		Experiment 6		Experiment 7	
	Control	Implanted	Control	Implanted	Control	Implanted	Control	Implanted	Control	Implanted
Number of steers	9	9	22	21	28	28	40	40	36	36
Duration of experiment (days)	118	118	95	95	56	56	84	84	119	119
Average initial weight (lb.)	990	982	826	823	615	615	539	538	648	663
Average gain (lb.)	95	118	59	107	77	97	118	139	107	128
Average daily gain (lb.)	0·81	1·00	0·62	1·13**	1·38	1·72**	1·40	1·65***	0·90	1·07
S.E. of daily gain	0·58		0·30		0·32		0·24		0·38	
% increase attributed to implant	24%		80%		25%		18%		20%	

** Difference significant at P <0·01. *** Difference significant at P <0·001.

TABLE LXXI

Animal Gains (in lb.) Attributed to Hexoestrol

Item	Control	Hexoestrol	S.E.
Number of steers	40	40	
Average gain in 28 days (lb.)	46	55*	17·89
Average gain in 56 days (lb.)	90	105**	19·57
Average gain in 84 days (lb.)	118	139***	20·23

* Difference significant at P <0·05.
** Difference significant at P <0·01.
*** Difference significant at P <0·001.

TABLE LXXII

The Effect of Variable Doses of Hexoestrol on the Subsequent Liveweight Gains of Grazing Hybrid Steers

Item	Dose of hexoestrol				S.E.
	0	30 mg.	45 mg.	60 mg.	
Number of steers	14	14	14	14	
Duration of experiment (days)	119	119	119	119	
Initial weight (lb.)	649	656	696	674	
Average gain (lb.)	107	142	132	132	
Average daily gain (lb.)	0·90	1·19	1·11	1·11	0·44
% increase attributed to implant		32%	23%	23%	

TABLE LXXIII

The Effects of Hormone Implantation on the Dressing Percentage of Jamaica Red Steers Slaughtered off Grass

Item	Expt. 2		Expt. 3		Expt. 4	
	Control	Hexoestrol	Control	Implant A	Control	Hexoestrol
Number of steers	9	9	10	10	12	7
Average full final weight (lb.)	1,085	1,100	1,063	1,084	911	966
Average starved final weight (lb.)	1,003	1,042	1,034	1,053	834	887
Average warm dressed carcase weight (lb.)	578	591	576	573	488	517
Dressing as % full final weight	53·3%	53·7%	54·3%	52·8%	53·5%	53·6%
Dressing as % empty final weight	57·6%	56·7%	55·7%	54·4%	58·5%	58·3%

TABLE LXXIV

THE EFFECTS OF BREEDING ON RESPONSES TO IMPLANTED HEXOESTROL (60 MG.)

Item	Jamaica Reds		Hybrids		S.E.
	Control	Hexoestrol	Control	Hexoestrol	
Number of steers	16	16	17	17	
Duration of experiment (days)	84	84	84	84	
Average initial weight (lb.)	539	534	543	542	
Average gain (lb.)	111	125	128	148	
Average daily gain (lb.)	1·32	1·49***a	1·52***a	1·76***abc	0·26

*** = Difference significant at P <0·001.
a = versus control Jamaica Red.
b = versus control hybrids.
c = versus hexoestrol Jamaica Reds.

TABLE LXXV

THE EFFECTS OF HEXOESTROL (60 MG.) ON THE SUBSEQUENT LIVEWEIGHT GAINS OF VARIOUS TYPES OF FATTENING STEERS

Item	Brahmans		Europeans		Hybrid		All groups	
	Control	Hexoestrol	Control	Hexoestrol	Control	Hexoestrol	Control	Hexoestrol
Number of steers	10	10	12	12	14	14	36	36
Duration of experiment (days)	119	119	119	119	119	119	119	119
Average initial weight (lb.)	620	622	671	682	649	674	648	663
Average gain (lb.)	81	116	129	131	107	132	107	128
Average daily gain (lb.)	0·68	0·98*	1·08	1·10	0·90	1·11	0·90	1·07
S.E. of daily gain	0·18		0·23		0·48		0·38	

* Difference significant at P <0·001.

TABLE LXXVI

A SUMMARY OF THE EFFECTS OF HEXOESTROL IMPLANTATION ON STEERS OF VARYING WEIGHTS

Experiment	Grazing quality	No. of treated steers	Approx. initial wt. (lb.)	Period of experiment (days)	Gain per day		% extra gain from treatment	Significance
					Control (lb.)	Treated (lb.)		
No. 2	Fair	9	1,000	118	0·81	1·00	24%	N.S.
No. 4	Fair	21	800	95	0·62	1·13	80%	<0·01
No. 5	Good	28	600	56	1·38	1·72	25%	<0·01
No. 6	Good	40	550	84	1·40	1·65	18%	<0·001
No. 7	Fair	36	650	119	0·90	1·07	20%	N.S.

TABLE LXXVII

THE EFFECTS OF TRANQUILIZER ON POST-WEANING LIVEWEIGHT GAINS OF BEEF CALVES

	Crossbreds paired for weight sex and sire		Crossbreds paired for weight sex and sire		Zebus, Europeans and crosses randomly grouped		Zebus paired for weight sex and sire		Crossbreds paired for weight sex and sire		Crossbreds paired for weight sex and sire	
Trial Number	1		2		3		4		5		6	
Treatment	Tranquilizer	Control	Tranquilizer	Control	Tranquilizer	Control	Tranquilizer	Control	Tranquilizer	Control	Tranquilizer	Control
Number of calves	7	7	6	6	11*	12	6	6	7	7	9	9
Average initial weight (lb.)	409	398	284	292	265	275	552	525	511	506	445	455
Average gain (lb.)	26	25	37	42	24	17	−35	−37	29	31	25	35
Days after weaning	50	50	47	47	21	21	99	99	50	50	50	50
Average daily gain (lb.)	0·52	0·50	0·79	0·89	1·14	0·81	−0·35	−0·37	0·58	0·62	0·50	0·70

* One animal missed the second weighing.

Breeding

In experiment 6, all steers were Jamaica Black, Jamaica Red, or produced by crossing cows of these breeds with Brahman bulls. There were only seven pairs of Jamaica Black steers; after discounting these there remained thirty-three pairs of either Jamaica Red or hybrid steers. An analysis of variance was carried out to study the effect of breed type and hormone. There was a very highly significant ($p < 0{\cdot}01$) response to both hormone treatment and to breed type (hybrids surpassing the Reds), but no interaction showed between the two. Table LXXIV shows the importance of the superior growth of the hybrids and emphasizes how faulty steer pairing can distort the interpretation of results when conducting experiments under ranching conditions.

In experiment 7, steers were paired as Brahmans, Europeans and hybrids. The Brahmans were a very uniform lot from a closed herd and gave a highly significant response to hexoestrol implantation. The hybrids had a much superior daily gain when compared with the Brahmans, but within the hybrid group there was a large standard error, and the increased gain due to hexoestrol was not significant. The European group contained very variable types of animals which could not be satisfactorily paired and the two groups of European types had similar weight gains. Table LXXV is of interest in that it shows the superior growth rate of the hybrids and the degree of response in the Brahmans where the experimental design minimized errors due to breeding, weight and nutrition.

The results of the experiments reported here suggest an increase in liveweight gain can be produced in grazing steers implanted with hexoestrol, and maintained on Jamaican pastures.

The carcase studies show a tendency for implanted steers to dress slightly lower than controls, but not significantly so. This trend has been noticed in England and in the United States. As far as carcase quality is concerned it is generally accepted that hormone-treated animals give a somewhat leaner carcase than untreated controls. This results in a slight lowering of the grade of treated carcases in the U.S. In Jamaica the leaner type of carcase seems to be preferred, and one butcher buying treated and non-treated steers from the same farm has expressed a definite preference for the implanted carcases, due to the fact that they have less fat on them.

Elevation of the tail-head and some enlargement of the rudimentary teat were two side effects which were noticed in many of the animals implanted with 60 mg. of hexoestrol. The fact that 30 mg. of hexoestrol in experiment 9 gave similar effects to the 60 mg. used in earlier experiments, appears to support the case made by workers in the U.K. and New Zealand for smaller doses (30 mg.) of hexoestrol.

Table LXXVI shows that hexoestrol was used in steer groups ranging from 550 to 1,000 lb. in weight. We were unable to detect any association between animal liveweight and hormone response within any of these experiments. All of these steers were aged between 18 months and 3 years—the age range in which most store and fat cattle are marketed in Jamaica. In this series significant responses were obtained in treatment groups where control gains ranged from 0·62 to 1·40 lb. liveweight per day. Most grass fattened steers in Jamaica have daily gains within this range. In the experiments with the lowest daily gains, the steers were grazing Guinea grass of high fibre content. This did not appear to inhibit the action of the hexoestrol.

In most cases where a response was obtained, it appeared to be of the order of a 20% increase in liveweight or 20 to 30 lb. in a 3 to 4 month period. These observations are not necessarily applicable to the results from using implant A, where there is a suggestion that the implant fails to give a significant response where liveweight gains are less than 1·4 lb. per day.

The fact that the hexoestrol response does not in any way appear to be associated with the proportion of either European or Brahman breeding is encouraging since a great deal of crossing between these two breeds occurs in Jamaica. The one hexoestrol experiment with pure Zebu (Mysore) steers aged 2 to 3 years gave a daily gain in the treated and control groups of 0·98 lb. and 0·68 lb. respectively. These figures are in very close agreement with recent work published in Brazil. A range of results was obtained with Jamaica Red and with hybrid steers, but in experiments 5 and 6 it was not possible to show significant differences between the responses of these two types of implantation. Since the majority of beef cattle on sugar estates are on the one hand either planned crossbreds, or on the other hand the result of a definite attempt to breed a Jamaica Red or a Jamaica Black type, it is of some practical value to know that the hormone gives a similar response in both types.

The economic implications of implantation also require comment, in that at current beef prices, a liveweight gain of 27 lb. attributed to implantation represents a profit of £2 over and above the cost of implantation with hexoestrol. With implant A there is a reduction of about 30% in the profitability of a gain of this order, due to the increased cost of the implant. On a very high plane of nutrition the increased gains induced by this latter implant may make its use economic, but under the conditions of this experiment, which are typical of the better type of beef farm in Jamaica, the use of implant A was not economic.

(H) Tranquilizers

A number of recent reports have suggested potential uses for tranquilizers. Beef calves which have not previously been handled are often weaned and moved to new pastures all in the space of a short time. It has been postulated that tranquilizers might reduce the stress associated with weaning, and help to reduce the weight losses that occur at this time. Reports on this subject from the U.S. are rather conflicting and it was therefore decided in 1958 to carry out a series of small-scale trials on this subject.

The tranquilizer used chlorpromazine (Largactil) is one of several phenothiazine derivatives widely used as

tranquilizing agents. Although high doses produce incoordination, small doses definitely have a tranquilizing action in cattle. The purpose of the trials reported here was to study the effects of chlorpromazine injections at weaning time on the subsequent liveweight gain of weaner calves. The calves were all grass fattened on the farms on which they were bred and liveweight gain comparisons were evaluated over a fairly long period. Any short term liveweight gain attributable to tranquilizer is of no economic benefit under the conditions on which these calves were reared, since they were all grass fattened on the breeders' farms for about 2 years following weaning. The calves were Brahman, European types and cross-breds. An attempt was made to see whether the noticeably different temperament of the Brahman types would in any way affect their response to tranquilizer as compared with the response of European types.

TABLE LXXVIII

MEAN RESULTS OF SIX TRIALS TO STUDY THE EFFECTS OF TRANQUILIZER ON POST-WEANING LIVEWEIGHT GAINS OF BEEF CALVES

	Tranquilizer	Control
No. of calves	46	47
Average initial weight (lb.) ..	411	408
Average gain (lb.)	18	19
Average dainly gain (lb.) ..	0·53	0·53

In none of the six experiments was there any statistically significant increase or depression in liveweight gain following the injection of the tranquilizer. There was a considerable variation in the average daily gain of the various trial groups and also in the liveweights of the weaner calves used. This is largely a reflection upon management. The cattle used in trials 1 and 2 grazed poor quality pastures and were driven some distance to the scales and had to be rested overnight before weaning. Some of their apparent post-weaning gain is probably stomach "fill." The calves used in trial 4 were reared on lush irrigated pasture and relegated to range lands after weaning; they were in addition weaned rather late in the year and the 99 days after weaning during which these calves lost weight were, for the most part, a dry spell during which the grazing was poor. Trials 5 and 6 were carried out in 1960 on the same farm as trials 1 and 2 were conducted in 1958. Trial 5 was in fact carried out using calves from the same herd as trial 1. In the intervening 2 years this farm has improved its pastures considerably and its weaning weights have markedly improved. There is, however, no evidence of response to tranquilizer in the calves reared in either year.

There was evidence of tranquilization in some treated calves for about 24 hours after injection, but this did not appear to have any practical value in these trials. There was no evidence of any difference in the behaviour between treated Zebu and European type cattle in trial 3, and in the purebred Zebu cattle in trial 4 there was no visible response to tranquilizer.

(I) New grass and legume varieties

Centrosema pubescens (centro) fromQueensl and has continued to grow fairly well. Yellowing of the leaves and very poor quality seed have, however, been widespread. At Frome the Centro has been planted in the troughs of Louisiana banks with pangola on the banks. Both plants have remained fairly discrete and the pangola has not been as vigorous as pangola supplied with sulphate of ammonia. Examination of Centrosema roots has shown that root nodules are sparse.

Townsville lucerne has not germinated in any nurseries.

Pennisetum ciliare (Buffel grass) has continued to grow well, even in low rainfall areas. Mechanical or hand cutting has caused this grass to clump and form very much thicker stands. Seeding seems to occur at all times of year. The grass does not seem to have a vigour or yield as heavy as pangola.

Indigofera hirsutum (hairy indigo) grows very well from imported seed, but it is an annual plant and its volunteering has been very poor indeed, so that this legume would not appear to be of value in a mixed sward with either guinea or molasses grass.

(J) Pasture management

The animal production unit at Grier Park was continued during the year. The output suffered as a result of marketing problems which interfered with the optimal stocking of this unit and a lower liveweight gain per acre was recorded than in 1959. Final figures are not yet available.

A $3 \times 3 \times 3$ factorial NPK cutting trial on pangola grass at Frome revealed some interesting results on the persistency of action of sulphate of ammonia. Dry matter yields were higher in treated plots for up to three cuttings following fertilization. April fertilization resulted in the greatest rise. 52% increase in dry matter resulted from 2 cwt. sulphate of ammonia at the May reaping and 100% increase in dry matter yield followed 4 cwt. sulphate of ammonia in April. The increase in dry matter following fertilization tended to tail off at subsequent cuttings although when heavy rain occurred this effect was marked.

The response to applied nitrogen expressed in terms of an increase in the crude protein yield (expressed in lb. per acre) was much less and persisted for a maximum of two reapings following fertilization. The control plots had a pasture crude protein percentage of between 6 and 7%. Treated plots did not show a rise to the 9 to 10% crude protein level considered desirable until after two applications of 2 cwt. sulphate of ammonia per acre. By this time some of the control plots had crude protein levels of below 5%.

Fertilization increased the yields per acre of crude protein from 249 to 507 lb. This is still only about a

third of the yield achieved in 1959 from pangola grass on bauxite soil at Grier Park and Grove Place.

Bearing in mind the low concentration of protein in the grass on the control plots, the total yield on these plots probably represents not more than 100 lb. liveweight gain per acre per annum. These results are in agreement with similar returns from Worthy Park (see section on urea-molasses).

The following conclusions can be drawn from the work on these two estates.

(1) Established pangola grass on the heavy clay soils of Frome and Worthy Park will, if unfertilized, have a crude protein concentration of 3 to 6% during much of the year. During the year of establishment the levels are usually higher than this range.

(2) This crude protein concentration is too low to achieve good animal growth and a liveweight gain in the region of 100 to 200 lb. per acre per annum can be expected from such grass.

(3) Such a liveweight gain is similar to that of unimproved pasture and does not justify the expense of pangola planting.

(4) On both farms the pangola responds rapidly and apparently economically to large quantities of applied nitrogen. There is some evidence to suggest that yields can be made to approach those of the 600 to 700 lb. liveweight per acre per annum achieved on a heavy clay at Bodles.

(5) It appears that the nitrogen is best applied in split applications at intervals of not more than two grazings.

(6) Further work is necessary to determine the optimum level of nitrogen application and also the effect of high levels of sulphate of ammonia on soil pH. This may be important at Worthy Park where some of the pangola pastures have a pH below 5, and a lime requirement (to bring the soil pH to 6·5) of 10 tons lime per acre.

(K) Urea-molasses

(a) Worthy Park trial

Considerable difficulty has been experienced in obtaining satisfactory winter growth of weaner steers at Worthy Park. A study carried out on the 1958 weaners revealed that during the 8 months, October to May inclusive, weaners gained below 0·5 lb. per head per day. It was therefore decided to study three methods of improving this situation during the winter of 1959–60. These methods were—

(i) supplementing the pasture with urea-molasses;

(ii) improving the pasture by the use of fertilizer;

(iii) a combination of (i) and (ii).

The treatments are detailed below—

Control

1 cwt. sulphate of ammonia per acre in August, 1959.

High molasses

1 cwt. sulphate of ammonia per acre in August, 1959.

1 week nil.

8 weeks at 3 gallons 3% urea-molasses per steer per week.

5 weeks at 3·5 gallons 3% urea-molasses per steer per week.

3 weeks nil.

8 weeks 3·5 gallons 3% urea-molasses per steer per week.

Total supplemental feeding period 21 weeks.

High fertilizer

September, 1959

2 cwt. sulphate of ammonia per acre.

0·25 cwt. muriate of potash per acre.

0·25 cwt. triple superphosphate per acre.

December, 1959

1 cwt. sulphate of ammonia per acre.

0·25 cwt. muriate of potash per acre.

0·25 cwt. triple superphosphate per acre.

March to April, 1960

1 cwt. sulphate of ammonia per acre.

Moderate fertilizer and low molasses

September, 1959

2 cwt. sulphate of ammonia per acre.

0·25 cwt. muriate of potash per acre.

0·25 cwt. triple superphosphate per acre.

December, 1959

1 cwt. sulphate of ammonia per acre.

0·25 cwt. muriate of potash per acre.

0·25 cwt. triple superphosphate per acre.

8 weeks at 3 gallons 1·5% urea in molasses per steer per week.

13 weeks at 2·25 gallons 1·5% urea in molasses per steer per week.

It is to be noted that on two occasions the experimental design had to be modified—

(i) In January all pastures had to be rested for 20 days and the steers grazed elsewhere.

(ii) From last March onward the urea-molasses lots experienced trouble with rain souring the supplement, and for the last 55 days of the experiment no urea-molasses was fed.

At the start of the experiment four Brahman, four Jamaica Black and four cross-bred steers of approximately equal size and weight were selected from the main weaner lot, and randomly divided into four groups each containing one animal of each breed type. These animals were weighed and each lot then grazed an area of 2 acres pangola grass divided into two 1-acre

pastures, which were fed alternatively, and supplemented as detailed above. From early November to late March, each group carried a fourth (Jamaica Black) steer so that the average stocking capacity over the whole period was 1·8 head per acre.

Although the number of steers is too small for satisfactory analysis the results definitely suggest a trend. Two steers (control Black and fertilizer Black*) have had very low and very high gains respectively which tended to make the control group total gain a little low, and the fertilizer total gain somewhat high.

TABLE LXXIX

INDIVIDUAL STEER GAINS (LB.)

	Indian	Black	Crossbred	Black*	Total
Control	100	34	114	(40)	288
Molasses	150	104	130	(60)	444
Fertilizer	130	190	200	(170)	690
Fertilizer + molasses	190	232	172	(70)	664
Total	570	560	616	(340)	2,086

* Group present for 148 days only.

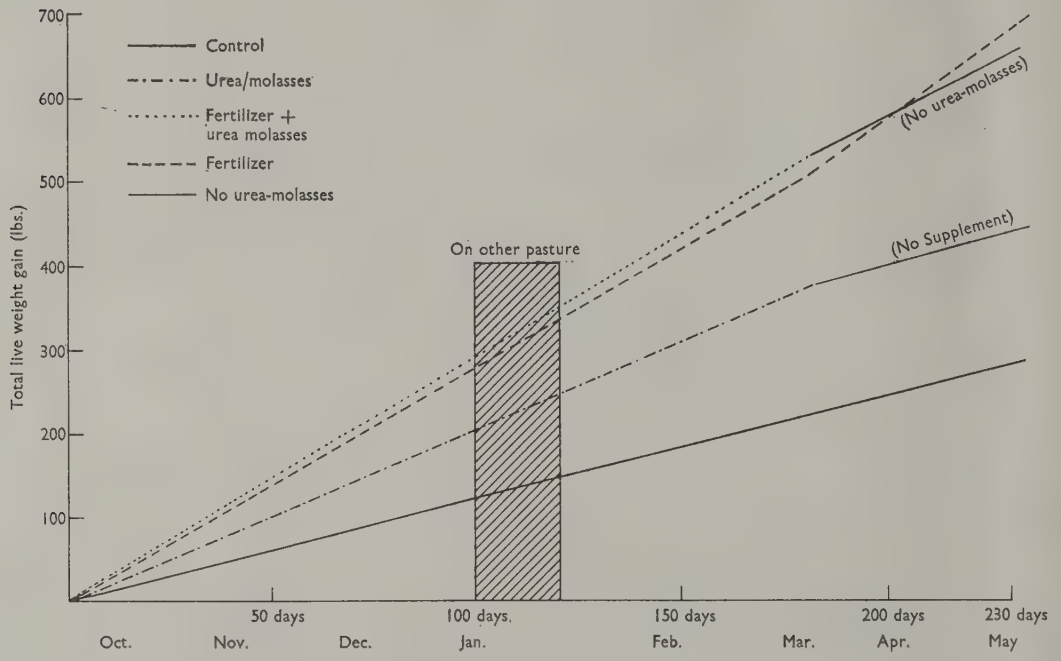


FIGURE 10

Liveweight gains of steer groups subjected to various wintering treatments at Worthy Park

Figure 9 shows that these gains were put on in a fairly steady fashion except that both molasses groups diminished and the fertilizer group accelerated their gain in the last 2 months.

Costs were charged as follows:—

Molasses at 6d. per gallon.
Urea at 38s. per 100 lb.
Sulphate of ammonia at 20s. per cwt.
Muriate of potash at 20s. per cwt.
Superphosphate at 30s. per cwt.

Economics of treatments

Table LXXX shows the results at the end of 176 days, 20 of which were spent off the trial area.

Table LXXXI shows the results at the end of 321 days. For the last 55 days of this period, the two molasses groups were without urea-molasses.

TABLE LXXX

RESULTS AT END OF 6 MONTHS

Treatment	Time (days)	Cost	Gain (lb.)	Gain over control (lb.)	Profit over control
Control	176	40s. 0d.	210	—	—
Molasses	176	210s. 8d.	370	160	21s.
Fertilizer	176	170s. 0d.	500	290	218s.
Fertilizer + Molasses	176	271s. 8d.	520	310	140s.

Table LXXXII summarizes the animal production data.

The control group

Animal production gains from 3 to 4-year-old unfertilized pangola pasture at Worthy Park totalled 145 lb. in 8 months. The pastures deteriorated during the year, and the pangola appeared to have had difficulty in surviving at the stocking rate practised.

TABLE LXXXI

RESULTS AT END OF 8 MONTHS

Treatment	Time (days)	Cost	Gain (lb.)	Gain over control (lb.)	Profit over control
Control	231	40s. 0d.	290	—	—
Molasses	231	210s. 8d.	445	155	15s.
Fertilizer	231	210s. 0d.	690	400	310s.
Fertilizer + Molasses	231	271s. 8d.	665	375	218s.

Profits have been calculated on the basis of 100 lb. liveweight being worth £6.

TABLE LXXXII

PER ACRE PRODUCTION (LB.)

Treatment	6 months (lb.)	8 months (lb.)	12 months (lb.) estimate
Control	105	145	215
Molasses	185	222	370
Fertilizer	250	345	510
Fertilizer + molasses	260	332	500

The urea-molasses group

Although animal production from this group nearly doubled that of the control group for the 6 months during which urea-molasses was fed, the cost of the supplement almost balanced the value of the extra returns. The very limited pasture analysis studies carried out suggest that it is possible that the pastures in this group may have provided so little protein that even with urea-molasses which can provide 40% of the animal's protein requirements, the total protein provided was inadequate for satisfactory growth. If we project the line of urea-molasses growth on the graph to estimate the probable gain in the last 55 days had urea-molasses been fed, we find that we could have expected 50 lb. gain, worth 60s., in return for 56s. worth of urea-molasses. In other words, at the level of growth obtained, the molasses was only just profitable.

The fertilizer group

A handsome profit arose from the use of 5 cwt. fertilizer per acre, and in addition the pastures of this group were in very good order at the end of the trial. The total gains from this group were below the group receiving fertilizer plus molasses, until the last 2 months when molasses feeding ceased. The last application of sulphate of ammonia gave a marked improvement in pasture condition and steer growth and it would appear as if some leeway has been made up towards eliminating the gross nitrogen deficiency of this area, since of the 84 lb. nitrogen applied per acre, only about half has been taken off as animal gains.

The total gain from these pastures is estimated at a little over 500 lb. gain per acre per annum, or about a half of what might be expected as the ultimate production at Worthy Park.

Fertilizer plus molasses

This treatment was very slightly superior to fertilizer alone until the last 2 months when the latter group received extra fertilizer, and this group ceased to receive fertilizer. Although the total production from the two groups was very similar (in fact but for one very rapid gaining steer in the fertilizer lot this would have been the best lot), the cost of the urea-molasses made this treatment less profitable than fertilizer alone.

Since both lots were initially grazing very poor pastures, and pasture production was so far below what it might be at Worthy Park, it is possible that on a higher nutritional plane the molasses would give a better return. It also appears to have been an error to feed 1·5% urea-molasses, as the preliminary analyses of this mixture suggest that its crude protein content may have been only about 6%, which may well have been poorer than the pastures after Christmas.

(b) Frome trial

A similar experiment at Frome gave results of somewhat limited value, since the pasture quality appeared to be so high that the control group were making very good daily gains, in fact these exceeded 1·5 lb. per head per day. With pasture of this quality, the urea-molasses intake was low and the gains attributed to the supplement were very small.

(c) Mixing of urea-molasses

Studies have been carried out of mixing efficiency in urea-molasses mixes in a pilot plant at Worthy Park. It seems preferable to add molasses to a strong solution of urea, in which case a uniform distribution of the urea occurs fairly rapidly if the mixture is well stirred. At Worthy Park using a 300-gallon mixing tank and a horizontal screw stirrer, there was no advantage in prolonging the mixing period beyond 1 hour.

(d) Chemical analysis of molasses samples

The results of chemical analysis of molasses samples are given in Table LXXXIII.

It would appear that all estates' molasses need phosphorus supplementation if they are to be used as a mineral supplement. Trace elements do not appear to be generally necessary, although in some cases the addition of iron might be of value. The very low copper figure at Vale Royal is also of interest, especially when compared with the figures in two of the samples from Long Pond. It is possible that these samples may have been contaminated, since their copper contents are so much higher than those of any other molasses examined.

TABLE LXXXIII

Estates	%							p.p.m.		
	K_2O	P_2O_5	Crude protein (N × 6·25)	Ash	Ca	Mg	Mn	Fe	Cu	Co
Frome 1	—	—	2·00	6·8	0·96	0·42	45	136	8·9	0·24
Frome 2	—	—		7·0	0·95	0·46	50	141	10·0	0·29
Vale Royal.. ..	3·0	0·12	—	6·7	1·1	0·44	16	83	4·2	0·12
Worthy Park 1 ..	—	—	2·00	9·8	1·2	0·56	47	125	9·5	0·27
Worthy Park 2 ..	—	—	3·25	11·6	1·6	0·67	56	152	14·0	0·36
Richmond	3·9	0·13	—	7·6	1·0	0·37	12	110	11·0	0·13
Caymanas	6·7	0·15	—	12·9	1·5	0·50	<12	106	10·0	0·22
Innswood	4·5	0·20	—	11·2	1·1	0·69	25	110	9·4	0·27
Long Pond 1 ..	2·96	0·11	—	6·4	0·71	0·55	16	93	13·0	0·12
Long Pond 2 ..	2·10	0·09	—	6·1	1·04	0·49	15	56	45·0	0·12
Long Pond 3 ..	2·72	0·16	—	7·6	0·97	0·54	20	65	56·0	0·14

(L) Publications

Three Livestock Bulletins were circulated during the year.

(1) February—The Weaner Calf Trade. This discussed the cost of weaner calf production and the economics of such a practice at current market prices.

(2) March—Cost Accounting Studies for Beef Production in 1959.

(3) July—Feeding Urea-Molasses to Beef Cattle.

Five Beef Market reports were also published. In addition, the Department was instrumental in tabulating the data and preparing the preliminary draft of the Livestock Development Committee's working party Report on Beef Marketing.

K. ACKNOWLEDGEMENTS

The willing co-operation of all estates' personnel is gratefully acknowledged. Their cheerfulness and keenness in helping to carry out experimental work are the more gratifying in the face of other preoccupations. Thanks are also particularly due to the Research Officers of Bernard Lodge, Frome, Jamaica Sugar Estates, Monymusk, Sevens, Trelawny Estates Limited, United Estates and Worthy Park for their valuable assistance.

APPPENDIX I

CANE YIELD SURVEY

TABLE I

ISLAND CANE CROP FOR PAST 10 YEARS

Crop year	Cane Ground						
	Total tonnage	% increase or decrease on previous crop	Tons purchased	% increase or decrease on previous crop	Tons estates	% increase or decrease on previous crop	Purchased cane % total
1951	2,425,748	−2·0	765,814	0·2	1,659,934	−3·0	32
1952	2,468,902	1·8	819,371	0·7	1,649,531	−0·6	33
1953	3,133,752	26·9	1,175,056	43·4	1,958,706	18·7	37
1954	3,503,788	11·8	1,380,096	17·5	2,123-692	8·4	39
1955	3,564,881	1·7	1,383,855	0·3	2,181,026	2·7	39
1956	3,219,977	−9·7	1,209,410	−12·6	2,010,567	−7·8	38
1957	3,394,278	5·4	1,297,132	7·3	2,097,146	4·3	38
1958	3,237,218	−4·6	1,253,044	−3·4	1,984,174	−5·4	39
1959	3,826,563	18·2	1,691,060	35·0	2,135,503	7·6	44
1960	4,325,886	13·1	1,862,640	10·2	2,463,246	15·4	43

In the above table the tonnages are for cane actually ground in the factories. They include cane, the juice from which was sent direct to the distilleries for rum manufacture.

TABLE II

ACREAGE REAPED BY EACH ESTATE CROPS, 1951–60

Estates	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960
Appleton	1,217	1,538	1,536	2,029	2,243	2,263	2,483	2,507	2,988	3,015
Barnett	852	786	817	834	944	954	973	973	1,004	949
Bernard Lodge	4,780	5,061	4,678	4,925	4,127	3,733	3,820	4,080	4,057	4,823
Caymanas	2,720	2,879	2,835	2,963	2,905	2,513	2,722	2,405	2,893	3,342
Frome	8,687	8,975	9,774	10,100	10,177	10,205	10,782	11,017	10,629	12,079
Gray's Inn Central	1,873	1,903	1,956	1,954	2,013	1,929	1,954	1,919	1,998	1,996
Green Park	—	333	500	—	—	—	—	—	—	—
Hampden	1,706	1,847	2,112	2,443	2,678	2,538	2,462	2,570	2,685	2,034
Holland	826	896	1,018	1,108	1,223	1,228	1,296	1,219	1,454	1,423
Innswood	2,065	2,208	1,809	2,168	1,940	2,219	2,059	1,866	2,413	2,662
Ironshore	752	—	—	—	—	—	—	—	—	—
Jamaica Sugar Estates	2,884	2,914	2,938	3,137	3,177	3,078	2,954	3,205	3,226	2,440
Monymusk	11,996	12,730	12,963	13,668	14,590	13,375	12,821	13,359	15,071	17,579
New Yarmouth	3,347	3,782	3,584	3,747	3,504	3,618	3,433	3,506	1,115	1,232
Richmond/Llandovery	1,497	1,429	1,461	1,482	1,505	1,529	1,569	1,603	1,780	1,826
Rose Hall	1,152	1,190	1,231	1,291	1,335	1,486	1,314	1,306	1,291	1,080
Serge Island	1,228	1,211	1,288	1,347	1,339	1,531	1,370	1,682	1,852	2,143
Sevens	1,584	1,851	2,095	2,107	1,942	1,834	1,915	1,993	2,585	2,778
Trelawny Estates	3,608	3,593	3,780	3,972	3,998	3,959	3,827	4,081	4,023	3,852
United Estates	1,597	1,926	1,747	1,948	1,925	1,823	2,156	2,411	2,487	2,581
Worthy Park	1,146	1,161	1,195	1,273	1,276	1,277	1,202	1,346	1,319	1,424
Total	55,517	58,213	59,317	62,496	62,841	61,092	61,139	63,048	64,870	69,258

TABLE III

TONS CANE PER ACRE BY ESTATES FOR CROPS, 1959–60, ALSO 10-YEAR AVERAGE

Year	Appleton	Barnett	Bernard Lodge	Cay-manas	Frome	Gray's Inn Central	Green Park	Hamp-den	Holland	Inns-wood	Jamaica Sugar Estates
1951	23·8	30·5	35·6	34·1	30·6	27·6	—	26·1	25·8	32·2	35·9
1952	15·9	29·4	28·5	31·5	30·3	30·8	16·2	20·3	20·1	28·2	33·8
1953	26·1	32·7	29·7	35·2	35·3	31·3	15·5	25·5	30·2	35·0	39·9
1954	34·3	35·4	31·0	41·7	35·8	32·8	—	23·1	30·9	33·5	36·2
1955	23·6	32·1	35·1	41·3	29·8	29·4	—	27·8	28·5	37·5	36·1
1956	28·6	28·0	29·3	39·9	30·5	32·7	—	21·1	23·0	32·5	33·4
1957	29·2	29·2	33·6	39·5	38·3	29·1	—	25·9	28·6	34·7	37·1
1958	30·1	28·1	30·2	39·5	31·4	26·6	—	23·0	26·7	32·0	37·3
1958	28·8	32·6	28·8	39·4	38·0	30·3	—	26·0	29·1	33·4	39·0
1960	31·8	36·4	33·0	39·2	34·3	31·7	—	30·7	36·8	35·5	37·9
10 year average	28·0	31·4	31·5	38·1	33·5	30·2	15·8	24·9	28·7	33·4	36·5

Year	Mony-musk	New Yar-mouth	Rich-mond/ Lland-overy	Rose Hall	Serge Island	Sevens	Trelawny Estates	United Estates	Worthy Park	Island average	Total acres
1951	30·9	34·3	23·9	21·2	26·0	33·1	21·4	26·1	22·8	29·9	55,515
1952	30·2	31·3	29·3	20·9	24·2	30·1	21·1	23·5	23·0	28·3	58,212
1953	36·9	34·2	24·8	18·4	31·7	37·2	26·7	31·0	35·5	33·0	59,316
1954	37·1	35·4	36·1	23·4	31·4	35·1	22·9	33·5	37·4	34·0	62,494
1955	41·0	36·7	33·4	23·9	36·5	40·7	33·1	31·2	36·6	34·8	62,840
1956	39·3	36·9	31·7	24·8	27·9	36·7	29·6	35·0	36·0	33·0	61,089
1957	38·0	32·4	30·4	24·0	27·4	35·0	27·8	37·5	37·1	34·3	61,139
1958	33·7	34·8	36·2	20·9	28·8	29·3	26·3	35·0	32·8	31·5	63,045
1959	31·3	38·7	31·4	25·9	31·9	36·0	28·5	35·4	37·6	33·0	64,866
1960	38·6	39·3	30·8	27·5	31·2	42·1	35·4	37·5	33·4	35·8	69,258
10 year average	35·8	24·3	30·8	22·4	29·9	35·9	27·3	33·0	33·4	31·2	—

TABLE IV

TONS CANE PER TON THEORETICAL 96° SUGAR BY ESTATES FOR 1956–60

Estates	1956	1957	1958	1959	1960
Appleton	7·86	8·41	8·13	7·82	7·78
Barnett	7·73	7·90	7·69	8·32	8·61
Bernard Lodge	7·83	7·84	8·40	8·46	8·91
Caymanas	8·48	8·71	10·22	9·97	10·11
Frome	8·12	9·10	8·39	9·62	9·19
Gray's Inn Central	9·68	9·08	11·88	11·57	11·82
Hampden	7·71	8·12	8·72	9·19	9·61
Holland	9·00	8·32	8·71	9·25	8·82
Innswood	8·66	8·35	9·40	11·07	9·55
Jamaica Sugar Estates	8·63	8·60	9·42	9·56	10·57
Monymusk	9·08	9·53	9·91	10·30	9·86
New Yarmouth	8·38	8·95	9·23	9·08	9·21
Richmond/Llandovery	8·52	8·41	10·65	9·42	9·51
Rose Hall	7·98	8·56	8·50	9·26	10·65
Serge Island	7·94	7·86	7·85	7·89	8·73
Sevens	8·70	8·57	9·51	9·25	9·68
Trelawny Estates	8·61	8·69	9·21	9·96	10·79
United Estates	7·84	8·01	8·05	8·31	8·81
Worthy Park	7·22	7·05	7·32	7·50	7·38
Average	8·46	8·75	9·05	9·45	9·48

Figures quoted are theoretical—based on 100 B.H.E. and 97% Pol Extraction.

TABLE V

TONS THEORETICAL 96° SUGAR PER ACRE BY ESTATES FOR 1956–60

Estates	1956 (theoretical)	1957 (theoretical)	1958 (theoretical)	1959 (theoretical)	1960 (theoretical)
Appleton	3·64	3·47	3·71	3·68	4·09
Barnett	3·62	3·70	3·65	3·92	4·23
Bernard Lodge	3·74	4·29	3·60	3·40	3·70
Caymanas	4·70	4·54	3·87	3·95	3·87
Frome	3·75	4·21	3·74	3·94	3·73
Gray's Inn Central	3·38	3·20	2·24	2·62	2·68
Hampden	2·73	3·19	2·64	2·83	3·19
Holland	2·56	3·44	3·06	3·25	4·17
Innswood	3·75	4·16	3·41	3·01	3·71
Jamaica Sugar Estates	3·88	4·11	3·96	4·08	3·59
Monymusk	4·32	3·99	3·41	3·03	3·91
New Yarmouth	4·40	3·62	3·77	4·26	4·27
Richmond/Llandovery	3·72	3·61	3·40	3·33	3·23
Rose Hall	3·11	2·80	2·46	2·79	2·58
Serge Island	3·52	3·49	3·67	4·04	3·57
Sevens	4·22	4·08	3·08	3·89	4·34
Trelawny Estates	3·45	3·20	2·85	2·83	3·29
United Estates	4·46	4·68	4·35	4·26	4·26
Worthy Park	4·98	5·27	4·48	5·00	4·52
Average	3·90	3·92	3·48	3·49	3·77

TABLE VI

CWT. THEORETICAL 96° SUGAR PER ACRE PER MONTH BY ESTATES FOR 1956–60

Estates	1956	1957	1958	1959	1960
Appleton	6·26 (96) 96*	5·96 (95) 92*	5·55 (96) 91*	6·26 (113) 105*	7·02 (118) 114*
Barnett	6·11 (93) 93*	6·06 (96) 93*	6·05 (104) 99*	6·78 (122) 114*	6·91 (116) 113*
Bernard Lodge	6·81 (104) 98*	6·41 (102) 101*	5·76 (99) 104*	5·69 (103) 108*	5·89 (99) 95*
Caymanas	7·48 (114) 108*	6·90 (110) 109*	5·87 (101) 106*	5·70 (103) 109*	6·09 (102) 98*
Frome	6·85 (105) 105*	6·73 (107) 104*	6·38 (110) 105*	5·98 (108) 100*	5·83 (98) 95*
Gray's Inn Central	5·63 (86) 93*	5·04 (80) 82*	3·86 (66) 71*	4·89 (88) 84*	4·05 (68) 79*
Hampden	4·36 (67) 83*	5·03 (80) 97*	4·08 (70) 90*	4·03 (73) 89*	4·69 (79) 95*
Holland	4·76 (73) 73*	5·70 (91) 88*	4·91 (85) 81*	4·91 (89) 82*	6·58 (110) 107*
Innswood	6·04 (92) 87*	5·99 (95) 95*	5·29 (91) 96*	4·52 (82) 86*	6·22 (104) 100*
Jamaica Sugar Estates	6·51 (100) 108*	7·10 (113) 115*	6·03 (104) 111*	6·03 (109) 103*	5·18 (87) 101*
Monymusk	7·09 (108) 102*	6·29 (100) 100*	6·04 (104) 109*	4·90 (88) 93*	6·14 (103) 99*
New Yarmouth	6·55 (99) 95*	5·81 (93) 92*	6·14 (106) 111*	6·50 (117) 124*	6·32 (106) 102*
Richmond/Llandovery	6·15 (94) 102*	6·06 (96) 98*	5·50 (95) 101*	5·81 (105) 99*	5·65 (95) 110*
Rose Hall	5·22 (80) 99*	4·70 (75) 91*	4·47 (77) 99*	4·66 (84) 103*	4·22 (71) 86*
Serge Island	5·52 (84) 91*	6·13 (98) 99*	5·93 (102) 109*	6·45 (116) 110*	5·69 (95) 111*
Sevens	7·12 (109) 103*	6·81 (108) 108*	5·64 (97) 102*	6·26 (113) 119*	7·04 (118) 114*
Trelawny Estates	5·87 (90) 112*	5·41 (86) 105*	4·79 (83) 106*	4·85 (88) 107*	5·27 (88) 107*
United Estates	7·22 (110) 93*	7·20 (115) 95*	7·40 (127) 96*	7·11 (128) 98*	6·57 (110) 93*
Worthy Park	8·65 (132) 111*	8·31 (132) 109*	8·33 (143) 108*	7·56 (136) 104*	7·98 (134) 114*
Average	6·54	6·28	5·81	5·54	5·96

Figures in brackets = cwt. theoretical sugar per acre per month expressed as a percentage of the island average in the same year.
Figures marked * = cwt. theoretical sugar per acre per month expressed as a percentage of the average for the ecological area in the same year.

TABLE VII

Total Acreage Under Variety % Total Acreage Reaped by Estates and Ecological Groups for Crops 1956–60

Estates	B3439					B34104					B37161					B37172					B41227				
	56	57	58	59	60	56	57	58	59	60	56	57	58	59	60	56	57	58	59	60	56	57	58	59	60
Appleton	—	—	—	—	—	15	8	2	1	—	2	2	3	1	1	19	19	13	7	1	42	40	46	46	47
Barnett	20	11	1	—	—	—	—	—	—	—	46	41	31	15	11	2	2	3	—	—	8	10	16	31	40
Frome	—	—	—	—	—	21	14	5	—	—	9	8	2	—	—	—	—	—	—	—	40	44	50	52	57
Holland	3	—	1	—	—	35	32	18	13	1	—	—	—	—	—	—	—	—	—	—	7	9	8	10	7
Wet West Estates	2	1	—	—	—	20	14	5	1	—	9	8	4	1	1	3	3	2	1	—	35	38	45	46	50
Hampden	1	1	—	—	—	—	—	—	—	—	26	22	17	10	6	—	—	—	—	—	1	2	4	9	11
Rose Hall	28	26	20	11	12	7	6	5	1	1	15	16	16	4	5	—	—	—	—	—	12	23	33	39	56
Trelawny Estates	5	4	1	1	—	4	2	1	—	—	26	22	18	15	9	—	—	—	—	—	3	4	8	10	15
Dry North Coast	8	6	4	2	2	3	2	1	—	—	24	21	17	12	7	—	—	—	—	—	4	7	11	14	20
Bernard Lodge	6	4	3	2	1	28	18	11	9	5	6	6	5	2	1	—	—	—	—	—	9	10	9	7	4
Caymanas	30	22	17	12	8	1	—	—	—	—	3	2	2	1	2	—	—	—	—	—	4	5	7	5	6
Innswood	1	1	1	1	—	74	69	57	51	35	—	—	—	—	—	—	—	—	—	—	15	19	33	40	56
Monymusk	6	2	1	1	1	1	—	—	—	—	1	1	—	—	—	—	—	—	—	—	51	64	69	69	61
New Yarmouth	33	22	16	13	16	3	1	—	—	—	3	1	1	—	—	—	—	—	—	—	19	20	17	20	20
Sevens	43	32	17	6	6	5	5	—	—	—	—	—	—	—	—	—	—	—	—	—	11	18	42	43	50
Irrigated Estates	14	9	6	3	2	11	9	6	6	4	2	2	1	1	—	—	—	—	—	—	31	38	43	47	44
Gray's Inn Central	7	7	6	8	8	4	1	1	1	—	—	—	—	—	—	42	36	32	29	29	—	—	—	2	5
Jamaica Sugar Estates	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	68	67	62	61	52	—	—	—	—	—
Richmond/Llandovery	39	21	9	5	5	1	1	1	1	1	15	9	6	3	—	—	—	—	—	—	16	32	39	41	—
Serge Island	6	4	—	—	—	—	—	—	—	—	—	—	—	—	—	65	59	40	25	17	1	—	5	10	12
Wet East Estates	10	7	5	3	3	1	—	—	—	—	3	2	1	1	—	48	45	39	34	26	3	6	7	11	13
United Estates	9	3	1	—	—	9	11	1	—	—	2	2	1	1	1	2	1	—	—	—	15	20	24	25	27
Worthy Park	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	28	27	36	40	39
Central Estates	5	2	1	—	—	6	7	—	—	—	1	1	1	1	—	1	—	—	—	—	21	23	28	30	31
Overall Average	9	6	4	2	2	11	8	4	3	2	7	6	4	2	1	7	7	6	5	3	24	29	34	37	39

TABLE VII—*continued*

Estates	B42231					B4362					Co331					Co421					Others				
	56	57	58	59	60	56	57	58	59	60	56	57	58	59	60	56	57	58	59	60	56	57	58	59	60
Appleton	—	—	—	2	2	11	18	26	31	39	4	2	2	1	1	—	—	—	—	—	7	11	8	11	9
Barnett	—	—	—	—	—	11	23	37	44	49	—	—	—	—	—	—	—	—	—	—	13	13	12	10	—
Frome	3	3	3	2	2	26	30	39	45	41	—	—	—	—	—	—	—	—	—	—	1	1	1	1	—
Holland	—	—	—	—	—	22	27	39	62	73	—	—	—	—	—	—	—	—	—	—	33	32	34	15	19
Wet West Estates	2	2	2	2	2	22	28	37	44	44	—	—	—	—	—	—	—	—	—	—	6	6	5	4	3
Hampden	—	—	1	1	—	14	19	25	27	33	3	5	7	8	10	1	1	1	3	1	54	49	45	42	39
Rose Hall	—	—	—	—	—	2	2	2	4	8	4	5	6	8	9	—	—	—	—	—	32	22	18	33	9
Trelawny Estates	2	3	4	5	4	7	7	10	11	17	14	17	27	34	36	19	19	14	12	6	20	22	17	14	13
Dry North Coast	1	2	2	2	2	9	10	14	16	20	9	10	18	21	25	10	10	7	7	4	32	32	26	26	20
Bernard Lodge	24	33	43	56	62	23	25	26	22	25	—	—	—	—	—	—	—	—	—	—	4	4	3	2	2
Caymanas	28	38	39	42	48	25	26	29	32	31	1	—	—	—	—	1	1	1	—	—	7	6	6	8	5
Innswood	—	—	—	—	1	—	1	2	1	1	—	—	—	—	—	—	—	—	—	—	10	10	7	7	7
Monymusk	22	18	14	8	7	11	8	10	15	22	—	—	—	—	—	—	—	—	—	—	8	7	6	7	9
New Yarmouth	27	35	44	44	44	7	9	12	10	15	—	—	—	—	—	—	—	—	—	—	8	12	10	13	5
Sevens	5	5	6	6	4	30	33	30	39	36	—	—	1	1	—	—	—	—	—	—	6	7	4	5	4
Irrigated Estates	21	22	23	19	20	14	14	15	18	23	—	—	—	—	—	—	—	—	—	—	7	6	6	6	7
Gray's Inn Central	2	1	3	4	5	28	41	43	43	42	—	—	—	—	—	—	—	—	—	—	17	14	15	13	11
Jamaica Sugar Estates	—	—	—	—	—	26	26	26	35	40	—	—	—	—	—	—	—	—	—	—	6	7	12	4	8
Richmond/Llandovery	—	1	1	2	4	14	23	31	35	33	—	—	—	—	—	—	—	—	—	—	14	13	13	13	15
Serge Island	—	—	—	1	—	23	28	47	56	54	—	—	—	—	—	—	—	—	—	—	5	9	8	7	16
Wet East Estates	—	—	1	2	2	24	29	35	41	42	—	—	—	—	—	—	—	—	—	—	11	11	12	8	14
United Estates	7	7	8	9	9	42	44	55	56	55	—	—	—	—	—	—	—	—	—	—	14	12	10	9	8
Worthy Park	5	1	—	—	—	51	57	51	44	43	—	—	—	—	—	—	—	—	—	—	16	15	13	16	18
Central Estates	6	5	5	6	6	46	49	54	51	51	—	—	—	—	—	—	—	—	—	—	14	13	11	12	12
Overall Average	10	11	11	10	11	18	21	25	30	32	2	2	2	3	3	1	1	1	1	—	11	9	9	7	7

TABLE VIII

PLANT ACREAGE UNDER VARIETY % TOTAL PLANT ACREAGE REAPED BY ESTATES AND ECOLOGICAL GROUPS FOR CROPS, 1956–60

Estates	B3439					B37161					B37172					B41227				
	56	57	58	59	60	56	57	58	59	60	56	57	58	59	60	56	57	58	59	60
Appleton	—	—	—	—	—	—	—	—	—	—	2	5	1	—	—	56	20	19	40	35
Barnett	—	—	—	—	—	4	—	—	—	32	—	—	—	—	—	55	21	32	68	56
Frome	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	62	52	48	58	71
Holland	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	22	—	—	—
Wet West Estates	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	59	41	39	50	58
Hampden	—	—	—	—	—	8	6	8	—	—	—	—	—	—	—	6	10	13	22	10
Rose Hall	6	—	—	—	—	17	—	3	4	—	—	—	—	—	—	44	100	76	83	73
Trelawny Estates	—	—	—	—	—	1	9	8	2	—	1	—	—	—	—	12	12	13	24	25
Dry North Coast	2	—	—	—	—	8	8	7	1	—	—	—	—	—	—	22	28	18	30	26
Bernard Lodge	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7	17	—	2	2
Caymanas	13	3	—	2	—	—	—	—	2	—	—	—	—	—	—	15	10	15	3	9
Innswood	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	100	79	86	77	85
Monymusk	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	60	82	69	65	37
New Yarmouth	—	3	16	—	—	2	—	—	—	—	—	—	—	—	—	10	10	16	3	32
Sevens	—	—	—	4	11	—	—	—	—	—	—	—	—	—	—	22	60	88	42	54
Irrigated Estates	1	1	2	1	1	—	—	—	—	—	—	—	—	—	—	41	51	54	40	31
Gray's Inn Central	3	9	8	22	4	—	—	—	—	—	18	8	49	23	55	—	—	—	20	23
Jamaica Sugar Estates	—	—	—	—	—	—	—	—	—	—	52	88	43	37	51	—	—	—	—	—
Richmond/Llandovery	—	—	—	—	8	1	—	—	—	—	—	—	—	—	—	52	57	51	40	42
Serge Island	—	—	—	—	—	—	—	—	—	—	27	47	8	10	11	—	6	11	17	26
Wet East Estates	—	3	1	3	2	—	—	—	—	—	28	23	22	19	26	12	24	16	16	22
United Estates	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	14	40	24	25	36
Worthy Park	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	25	84	43	19
Central Estates	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	10	37	38	30	32
Overall Average	1	1	1	1	1	1	1	1	—	—	1	1	1	2	2	39	42	38	40	35

TABLE VIII—*continue*

Estates	B42231					B4362					Co331					Others				
	56	57	58	59	60	56	57	58	59	60	56	57	58	59	60	56	57	58	59	60
Appleton	—	—	3	6	—	21	47	77	37	51	10	—	—	—	—	11	28	—	17	14
Barnett	—	—	—	2	—	44	79	67	30	32	—	—	—	—	—	17	—	1	—	—
Frome	5	2	1	—	—	33	44	50	41	28	—	—	—	—	—	—	2	1	1	1
Holland	—	—	—	—	—	80	60	52	82	83	—	—	—	—	—	—	18	48	18	17
Wet West Estates	4	2	1	1	—	33	48	55	44	36	2	—	—	—	—	2	8	5	5	5
Hampden	4	—	—	—	—	24	54	38	22	17	2	14	13	15	9	56	16	28	41	64
Rose Hall	—	—	—	—	—	—	—	—	13	27	19	—	9	—	—	14	—	12	—	—
Trelawny Estates	5	19	5	3	—	26	18	18	18	26	22	25	43	39	34	33	17	13	17	15
Dry North Coast	3	6	3	1	—	19	25	24	20	23	24	22	31	24	23	22	11	17	24	28
Bernard Lodge	75	65	73	82	59	13	18	27	13	35	—	—	—	—	—	5	—	—	3	4
Caymanas	58	51	44	50	55	5	32	41	35	29	3	—	—	1	—	6	4	—	7	7
Innswood	—	—	—	2	2	—	—	—	—	2	—	—	—	—	—	—	19	14	21	11
Monymusk	20	11	10	—	2	10	—	13	27	41	—	—	—	—	—	10	7	8	8	19
New Yarmouth	68	63	40	77	49	10	7	16	5	14	—	—	—	—	—	10	17	12	15	5
Sevens	55	5	—	5	7	25	34	3	44	26	—	—	5	—	—	18	1	9	5	2
Irrigated Estates	34	31	20	20	22	10	11	15	28	33	—	—	—	—	—	14	6	9	11	13
Gray's Inn Central	15	5	18	12	12	64	60	14	11	—	—	—	—	—	—	—	18	11	12	6
Jamaica Sugar Estates	—	—	—	—	—	40	12	42	61	34	—	—	—	—	—	8	—	15	2	15
Richmond/Llandovery	1	3	1	—	17	36	28	37	48	16	3	—	—	—	—	7	12	11	12	17
Serge Island	—	—	—	1	—	73	47	67	66	55	—	—	—	—	—	—	—	14	6	8
Wet East Estates	3	3	3	2	5	55	37	45	53	33	—	—	—	—	—	2	10	13	7	12
United Estates	5	9	7	12	7	76	44	63	48	44	—	—	—	—	—	5	7	6	13	13
Worthy Park	33	—	—	—	—	64	17	12	30	66	—	—	—	—	—	3	58	4	27	15
Central Estates	13	7	5	8	6	72	39	51	43	49	—	—	—	—	—	5	17	6	17	13
Overall Average	18	16	10	10	14	27	27	33	34	33	3	2	4	3	3	8	8	10	10	12

TABLE IX

Tons Cane per Acre for Varieties by Estates and Ecological Groups—Crop, 1960

Estates	B3439	B34104	B37161	B37172	B41227	B42231	B4362	Co331	Co421	Mixed and others	Average
Appleton	—	—	29·1	23·9	32·5	35·0	30·8	30·1	—	33·7	31·8
Barnett	—	—	33·7	—	38·8	—	35·1	—	—	—	36·4
Frome	—	—	24·1	—	35·1	34·4	33·4	—	—	30·5	34·3
Holland	—	30·1	—	—	32·8	—	38·1	—	—	33·5	36·8
Wet West Estates	—	30·1	32·2	23·9	34·8	34·5	33·7	30·1	—	33·3	34·2
Hampden	—	—	25·2	—	36·5	—	28·8	33·7	25·1	31·0	30·7
Rose Hall	25·1	28·8	23·2	—	29·1	—	26·7	25·6	—	24·3	27·5
Trelawny Estates	—	—	31·4	36·5	40·7	32·6	33·7	36·1	34·6	33·8	35·4
Dry North Coast	25·1	28·8	29·0	36·5	35·0	32·6	30·9	35·2	33·7	31·5	32·8
Bernard Lodge	31·0	29·5	26·7	—	36·3	30·9	37·8	—	—	42·5	33·0
Caymanas	36·8	—	33·7	—	40·5	39·2	39·3	—	—	42·4	39·2
Innswood	—	27·5	—	—	39·9	39·5	38·0	—	—	39·7	35·5
Monymusk	40·9	—	—	—	36·9	28·5	45·3	—	—	40·5	38·6
New Yarmouth	32·4	—	—	—	41·6	41·2	39·5	—	—	35·0	39·3
Sevens	40·8	—	—	—	44·8	38·9	39·1	—	—	38·9	42·1
Irrigated Estates	36·7	28·0	31·3	—	38·2	33·6	42·2	—	—	40·4	37·9
Gray's Inn Central	32·8	—	—	32·6	34·6	33·2	30·2	—	—	32·6	31·7
Jamaica Sugar Estates	—	—	—	42·8	—	—	31·1	—	—	40·5	37·9
Richmond/Llandovery	30·3	34·3	23·2	—	31·7	32·5	29·9	—	—	29·7	30·8
Serge Island	—	—	24·7	32·6	36·8	36·2	32·2	—	—	22·5	31·2
Wet East Estates	31·9	34·3	24·2	38·5	33·1	33·0	31·0	—	—	30·0	33·2
United Estates	—	—	38·7	—	40·6	37·6	35·9	—	—	38·1	37·5
Worthy Park	—	—	—	—	34·0	19·1	33·2	—	—	32·8	33·4
Central Estates	—	—	38·7	—	37·7	37·3	35·1	—	—	35·3	36·1
Overall Average	34·4	28·1	29·9	38·2	36·7	33·7	36·0	35·1	33·7	35·3	35·8

TABLE X

Tons Cane per Ton Theoretical 96° Sugar for Varieties by Estates and Ecological Groups—Crop, 1960

Estates	B3439	B34104	B37161	B37172	B41227	B42231	B4362	Co331	Co421	Mixed and others	Average
Appleton	—	—	7·12	7·59	7·85	8·38	7·59	8·16	—	8·05	7·78
Barnett	—	—	8·38	—	9·32	—	8·12	—	—	—	8·61
Frome	—	—	10·71	—	9·50	8·93	8·78	—	—	9·89	9·19
Holland	—	8·14	—	—	8·85	—	8·82	—	—	8·87	8·82
Wet West Estates	—	8·14	8·23	7·59	9·20	8·81	8·55	8·16	—	8·55	8·87
Hampden	—	—	9·06	—	10·53	—	9·10	10·30	9·29	9·65	9·61
Rose Hall	10·43	10·07	9·47	—	10·71	—	10·52	10·98	—	10·39	10·65
Trelawny Estates	—	—	9·76	9·88	11·33	10·02	10·01	11·37	10·51	10·61	10·79
Dry North Coast	10·43	10·07	9·58	9·88	10·97	10·02	9·61	11·22	10·41	10·05	10·42
Bernard Lodge	8·43	9·03	9·90	—	9·51	8·89	8·81	—	—	9·09	8·91
Caymanas	9·61	—	10·63	—	11·15	10·19	9·95	—	—	9·78	10·11
Innswood	—	8·95	—	—	9·81	10·11	8·66	—	—	9·91	9·55
Monymusk	10·06	—	—	—	9·80	9·51	9·94	—	—	10·15	9·86
New Yarmouth	9·66	—	—	—	9·51	8·97	9·01	—	—	9·72	9·21
Sevens	9·25	—	—	—	10·03	8·57	9·36	—	—	9·82	9·68
Irrigated Estates	9·54	8·97	10·40	—	9·83	9·34	9·65	—	—	10·02	9·69
Gray's Inn Central	12·10	—	—	12·02	12·35	11·24	11·63	—	—	11·90	11·82
Jamaica Sugar Estates	—	—	—	11·09	—	—	9·79	—	—	10·44	10·57
Richmond/Llandovery	9·02	9·65	10·04	—	9·93	9 57	9·18	—	—	9·21	9·61
Serge Island	—	—	10·03	8·54	8·84	10·85	8·79	—	—	8·51	8·73
Wet East Estates	10·83	9·65	10·04	10·82	9·79	10·53	9·66	—	—	9·86	10·08
United Estates	—	—	9·05	—	10·61	9·10	8·45	—	—	8·89	8·81
Worthy Park	—	—	—	—	7·68	6·65	7·05	—	—	7·55	7·38
Central Estates	—	—	9·05	—	8·64	9·07	7·99	—	—	8·17	8·28
Overall Average	9·83	8·97	9·40	10·77	9·61	9·34	9·10	11·12	10·41	9·67	9·48

TABLE XI

TONS THEORETICAL 96° SUGAR PER ACRE FOR VARIETIES BY ESTATES AND ECOLOGICAL GROUPS—CROP, 1960

Estates	B3439	B34104	B37161	B37172	B41227	B42231	B4362	Co331	Co421	Mixed and others	Average
Appleton	—	—	4·08	3·14	4·13	4·18	4·05	3·69	—	4·18	4·09
Barnett	—	—	4·02	—	4·16	—	4·33	—	—	—	4·23
Frome	—	—	2·25	—	3·69	3·85	3·80	—	—	3·09	3·73
Holland	—	3·70	—	—	3·71	—	4·32	—	—	3·77	4·17
Wet West Estates	—	3·70	3·91	3·14	3·78	3·92	3·94	3·69	—	3·89	3·86
Hampden	—	—	2·78	—	3·46	—	3·16	3·28	2·71	3·21	3·19
Rose Hall	2·41	2·86	2·45	—	2·71	—	2·53	2·33	—	2·34	2·58
Trelawny Estates	—	—	3·22	3·70	3·59	3·25	3·36	3·18	3·29	3·19	3·29
Dry North Coast	2·41	2·86	3·03	3·70	3·19	3·25	3·22	3·14	3·24	3·13	3·15
Bernard Lodge	3·67	3·26	2·70	—	3·82	3·48	4·29	—	—	4·67	3·70
Caymanas	3·83	—	3·17	—	3·64	3·85	3·95	—	—	4·34	3·87
Innswood	—	3·08	—	—	4·07	3·91	4·39	—	—	4·01	3·71
Monymusk	4·06	—	—	—	3·77	3·00	4·56	—	—	3·99	3·91
New Yarmouth	3·35	—	—	—	4·37	4·59	4·39	—	—	3·60	4·27
Sevens	4·41	—	—	—	4·47	4·55	4·18	—	—	3·96	4·34
Irrigated Estates	3·85	3·12	3·01	—	3·88	3·60	4·37	—	—	4·04	3·91
Gray's Inn Central	2·71	—	—	2·71	2·80	2·95	2·59	—	—	2·74	2·68
Jamaica Sugar Estates	—	—	—	3·86	—	—	3·17	—	—	3·88	3·59
Richmond/Llandovery	3·36	3·55	2·31	—	3·19	3·40	3·26	—	—	3·22	3·23
Serge Island	—	—	2·46	3·81	4·17	3·34	3·66	—	—	2·65	3·57
Wet East Estates	2·94	3·55	2·41	3·55	3·38	3·13	3·21	—	—	3·04	3·29
United Estates	—	—	4·27	—	4·30	4·14	4·25	—	—	4·29	4·26
Worthy Park	—	—	—	—	4·42	2·88	4·70	—	—	3·34	4·52
Central Estates	—	—	4·27	—	4·36	4·14	4·39	—	—	3·31	4·35
Overall Average	3·50	3·13	3·18	3·55	3·81	3·61	3·96	3·15	3·24	3·65	3·77

TABLE XII

CWT. THEORETICAL 96° SUGAR PER ACRE PER MONTH FOR VARIETIES BY ESTATES AND ECOLOGICAL GROUPS—CROP, 1960

Estates	B3439	B34104	B37161	B37172	B41227	B42231	B4362	Co331	Co421	Mixed and others	Average
Appleton	—	—	6·28	5·42	6·88	7·12	7·34	5·95	—	7·03	7·02
Barnett	—	—	6·33	—	6·78	—	7·16	—	—	—	6·91
Frome	—	—	1·52	—	5·61	5·72	6·21	—	—	4·86	5·83
Holland	—	6·26	—	—	6·00	—	6·80	—	—	5·96	6·58
Wet West Estates	—	6·26	5·64	5·42	5·85	5·98	6·51	5·95	—	6·31	6·14
Hampden	—	—	4·04	—	5·26	—	4·77	4·92	4·42	4·52	4·69
Rose Hall	3·95	4·61	4·18	—	4·42	—	4·20	3·72	—	3·88	4·22
Trelawny Estates	—	—	5·36	6·05	5·47	5·38	5·71	4·99	5·00	5·26	5·27
Dry North Coast	3·95	4·61	4·89	6·05	5·00	5·38	5·15	4·91	4·95	4·72	4·93
Bernard Lodge	6·01	6·53	4·28	—	6·19	5·59	6·50	—	—	7·67	5·89
Caymanas	6·36	—	5·24	—	5·42	6·00	6·23	—	—	6·93	6·09
Innswood	—	5·34	—	—	6·70	6·46	7·35	—	—	6·45	6·22
Monymusk	6·75	—	—	—	5·95	5·08	6·93	—	—	6·19	6·14
New Yarmouth	5·44	—	—	—	6·06	7·02	6·29	—	—	4·61	6·32
Sevens	6·93	—	—	—	6·95	7·32	7·25	—	—	6·36	7·04
Irrigated Estates	6·28	5·39	4·89	—	6·12	5·77	6·78	—	—	6·28	6·19
Gray's Inn Central	4·28	—	—	3·86	4·02	4·78	4·05	—	—	4·12	4·05
Jamaica Sugar Estates	—	—	—	5·42	—	—	4·83	—	—	5·17	5·18
Richmond/Llandovery	5·64	6·05	3·98	—	5·55	5·24	5·79	—	—	5·82	5·65
Serge Island	—	—	3·79	5·84	6·45	5·81	5·82	—	—	4·52	5·69
Wet East Estates	4·75	6·05	3·85	5·08	5·63	4·99	5·11	—	—	4·86	5·12
United Estates	—	—	6·61	—	6·50	6·48	6·65	—	—	6·37	6·57
Worthy Park	—	—	—	—	8·09	4·79	8·02	—	—	7·66	7·98
Central Estates	—	—	6·61	—	7·13	6·45	7·05	—	—	7·00	7·03
Overall Average	5·70	5·40	5·03	5·09	6·00	5·77	6·34	4·94	4·95	5·70	5·97

TABLE XIII

Comparison of Varieties Showing Actual Yields and Expressed as a Percentage of B4362—Crop, 1960

	B4362	B3439	B34104	B37161	B37172	B41227	B42231	Co331	Co421
Tons cans per acre per month	2·88 (100) 2·76 (100) 2·87 (100) 2·87 (100) 2·84 (100) 2·84 (100) 2·87 (100) 2·88 (100)	2·80 (97)	2·42 (88)	2·32 (82)	2·74 (95)	2·88 (101)	2·70 (95)	2·75 (96)	2·58 (90)
Cwt. sugar per acre per month	6·31 (100) 6·08 (100) 6·29 (100) 6·21 (100) 6·05 (100) 6·20 (100) 6·23 (100) 6·32 (100)	5·70 (90)	5·40 (89)	5·03 (80)	5·09 (82)	6·00 (99)	5·77 (93)	4·94 (79)	4·95 (78)
Tons cane per ton sugar	9·13 (100) 9·10 (100) 9·11 (100) 9·24 (100) 9·38 (100) 9·16 (100) 9·22 (100) 9·11 (100)	9·83 (93)	8·97 (101)	9·40 (97)	10·77 (86)	9·61 (98)	9·34 (98)	11·12 (83)	10·41 (88)

TABLE XIV

Tons Cane per Acre for Estates by Cane Class—Crop, 1960

Estates	Fall plants	Spring plants	Standover spring	1st ratoons	2nd ratoons	3rd ratoons	Old cane	Average
Appleton	44·7	38·0	—	35·0	29·4	28·0	30·0	31·8
Barnett	49·9	48·3	—	41·1	34·5	36·2	31·1	36·4
Bernard Lodge	49·5	40·9	—	30·0	29·8	23·6	28·0	33·0
Caymanas	55·2	39·9	—	38·5	32·5	33·4	37·5	39·2
Frome	—	40·3	—	36·5	33·0	32·6	32·4	34·3
Gray's Inn Central	29·3	40·5	—	28·3	29·0	29·1	33·3	31·7
Hampden	38·9	39·9	—	38·2	28·2	29·0	25·3	30·7
Holland	—	49·6	39·9	38·4	33·3	35·5	32·0	36·8
Innswood	—	48·9	—	40·6	36·7	30·4	27·8	35·5
Jamaica Sugar Estates	47·4	48·3	—	37·9	32·8	37·2	37·7	37·9
Monymusk	53·2	47·6	43·1	38·0	34·2	32·4	36·3	38·6
New Yarmouth	56·6	37·8	48·1	41·8	34·5	36·0	32·9	39·3
Richmond/Llandovery	41·7	40·3	—	31·6	29·7	29·3	28·1	30·8
Rose Hall	—	35·1	—	28·0	26·7	26·4	25·2	27·5
Serge Island	51·0	37·9	—	34·1	29·0	31·0	24·1	31·2
Sevens	70·5	47·1	—	40·6	40·2	47·0	35·1	42·1
Trelawny Estates	49·3	40·1	—	38·1	34·1	35·0	30·3	35·4
United Estates	50·0	46·2	—	40·4	35·5	38·5	33·0	37·5
Worthy Park	—	34·2	—	35·7	34·7	33·1	35·4	33·4
Average	50·7	43·4	45·4	36·7	32·9	32·6	32·6	35·8

TABLE XV

TONS CANE PER TON THEORETICAL 96° SUGAR FOR ESTATES BY CANE CLASS—CROP, 1960

Estates	Fall plants	Spring plants	Standover spring	1st ratoons	2nd ratoons	3rd ratoons	Old cane	Average
Appleton	7·12	8·17	—	7·98	7·57	7·42	7·68	7·78
Barnett	8·52	9·36	—	8·91	8·92	7·91	8·25	8·61
Bernard Lodge	8·45	9·47	—	8·79	8·86	8·79	8·80	8·91
Caymanas	10·86	10·15	—	10·20	9·68	9·35	10·01	10·11
Frome	—	9·26	—	8·97	9·01	9·62	9·25	9·19
Gray's Inn Central	12·09	12·31	—	11·74	11·69	11·93	11·78	11·82
Hampden	9·19	10·94	—	9·84	9·31	9·47	9·43	9·61
Holland	—	9·56	10·17	8·86	8·44	8·18	8·69	8·82
Innswood	—	10·30	—	9·78	9·51	9·16	8·96	9·55
Jamaica Sugar Estates	9·99	12·41	—	10·32	10·11	11·75	10·82	10·57
Monymusk	10·31	10·27	10·44	9·82	9·56	9·75	9·70	9·86
New Yarmouth	8·83	9·05	9·65	9·05	8·39	9·71	9·36	9·21
Richmond/Llandovery	8·89	10·85	—	9·54	9·56	9·41	8·85	9·51
Rose Hall	—	11·10	—	10·59	10·53	11·32	10·36	10·65
Serge Island	8·44	9·15	—	8·83	8·85	8·37	8·50	8·73
Sevens	10·51	10·07	—	9·49	9·15	10·18	9·46	9·68
Trelawny Estates	10·78	11·36	—	11·24	10·55	10·09	10·48	10·79
United Estates	8·36	9·42	—	8·79	8·86	8·95	8·51	8·81
Worthy Park	—	7·77	—	8·07	7·36	7·76	7·15	7·38
Average	9·73	9·92	9·96	9·42	9·27	9·43	9·37	9·48

TABLE XVI

TONS THEORETICAL 96° SUGAR PER ACRE FOR ESTATES BY CANE CLASS—CROP, 1960

Estates	Fall plants	Spring plants	Standover spring	1st ratoons	2nd ratoons	3rd ratoons	Old cane	Average
Appleton	6·28	4·65	—	4·38	3·88	3·78	3·88	4·09
Barnett	5·85	5·16	—	4·61	3·87	4·58	3·77	4·23
Bernard Lodge	5·86	4·32	—	3·42	3·36	2·68	3·18	3·70
Caymanas	5·08	3·93	—	3·77	3·36	3·58	3·74	3·87
Frome	—	4·35	—	4·08	3·66	3·38	3·51	3·73
Gray's Inn Central	2·42	3·29	—	2·41	2·48	2·44	2·82	2·68
Hampden	4·24	3·64	—	3·33	3·03	3·06	2·68	3·19
Holland	—	5·18	3·83	4·34	3·94	4·34	3·68	4·17
Innswood	—	4·75	—	4·16	3·86	3·32	3·11	3·71
Jamaica Sugar Estates	4·74	3·89	—	3·67	3·25	3·16	3·48	3·59
Monymusk	5·17	4·63	4·13	3·87	3·58	3·32	3·74	3·91
New Yarmouth	6·41	4·18	4·98	4·62	4·11	3·71	3·52	4·27
Richmond/Llandovery	4·69	3·72	—	3·31	3·11	3·11	3·17	3·23
Rose Hall	—	3·16	—	2·64	2·54	2·33	2·43	2·58
Serge Island	6·05	4·13	—	3·87	3·27	3·70	2·83	3·57
Sevens	6·71	4·68	—	4·27	4·40	4·61	3·71	4·34
Trelawny Estates	4·57	3·53	—	3·39	3·23	3·46	2·90	3·29
United Estates	5·97	4·91	—	4·60	4·00	4·30	3·87	4·26
Worthy Park	—	4·41	—	4·42	4·72	4·32	4·53	4·52
Average	5·21	4·37	4·55	3·90	3·55	3·45	3·48	3·77

APPENDIX I

TABLE XVII

PERCENTAGE ACREAGE REAPED IN EACH CANE CLASS FOR ESTATES AND ECOLOGICAL GROUPS AND AVERAGE LENGTH OF GROWTH IN MONTHS

Estates	Fall plants	Spring plants	Standover spring	1st ratoons	2nd ratoons	3rd ratoons	Old cane	Average length of growth in months
Appleton	—	11	—	26	13	13	37	11·64
Barnett	1	10	—	19	23	15	32	12·23
Frome	—	13	—	19	17	12	39	12·80
Holland	—	13	3	24	18	12	30	12·66
Wet West Estates	—	13	—	20	17	12	38	—
Hampden	12	8	—	24	19	9	28	13·63
Rose Hall	—	16	—	16	12	10	46	12·23
Trelawny Estates	5	17	—	17	23	6	32	12·47
Dry North Coast	6	14	—	19	20	8	33	—
Bernard Lodge	10	20	—	16	14	9	31	12·58
Caymanas	11	22	—	18	13	8	29	12·72
Innswood	—	23	—	17	7	4	49	11·95
Monymusk	6	14	1	19	16	10	34	12·74
New Yarmouth	10	3	15	14	8	5	45	13·50
Sevens	1	23	—	29	15	12	20	12·33
Irrigated Estates	6	17	1	19	15	9	33	—
Gray's Inn Central	3	4	—	12	13	15	53	13·24
Jamaica Sugar Estates	10	—	—	16	16	4	54	13·86
Richmond/Llandovery	1	10	—	18	27	21	23	11·44
Serge Island	6	10	—	22	28	6	28	12·55
Wet East Estates	5	6	—	18	20	11	40	—
United Estates	3	11	—	16	24	15	31	12·96
Worthy Park	—	7	—	13	16	6	58	11·34
Central Estates	2	9	—	15	21	12	41	—
Overall Average	4	14	—	19	17	10	36	—
Average length of growth in months	16·72	13·11	19·77	12·41	12·25	12·29	12·33	12·65

TABLE XVIII

PERCENTAGE ACREAGE REAPED IN EACH CANE CLASS, 1958–60

Years	CANE CLASSES					
	Fall plants	Spring plants	1st ratoons	2nd ratoons	3rd ratoons	Old canes
1958	4	16	12	16	17	35
1959	8	14	18	11	13	35
1960	4	14	19	17	10	36

TABLE XIX

ACREAGE UNDER VARIETY %. TOTAL ACREAGE REAPED FOR ECOLOGICAL GROUPS, 1959 AND 1960

Ecological groups	VARIETIES																			
	B3439		B34104		B37161		B37172		B41227		B42231		B4362		Co331		Co421		Others	
	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960
Wet West	—	—	1	—	1	1	1	—	49	50	2	2	44	44	—	—	—	—	4	3
Dry North	2	2	—	—	12	7	—	—	14	20	2	2	16	20	21	25	7	4	26	20
Irrigated	3	2	6	4	1	—	—	—	47	44	19	20	18	23	—	—	—	—	6	7
Wet East	3	3	—	—	1	—	34	26	11	13	2	2	41	42	—	—	—	—	8	14
Central	—	—	—	—	1	—	—	—	30	31	6	6	51	51	—	—	—	—	12	12
Average	2	2	3	2	2	1	5	3	37	39	10	11	30	32	3	3	1	—	7	7

TABLE XX

PLANT ACREAGE UNDER VARIETY %. TOTAL PLANT ACREAGE REAPED FOR ECOLOGICAL GROUPS, 1959 AND 1960

Ecological groups	Varieties															
	B3439		B37161		B37172		B41227		B42231		B4362		Co331		Others	
	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960	1959	1960
Wet West	—	—	—	1	—	—	50	58	1	—	44	36	—	—	5	5
Dry North	—	—	1	—	—	—	30	26	1	—	20	23	24	23	24	28
Irrigated	1	1	—	—	—	—	40	31	20	22	28	33	—	—	11	13
Wet East	3	2	—	—	19	26	16	22	2	5	53	33	—	—	7	12
Central	—	—	2	—	—	—	30	32	8	6	43	49	—	—	17	13
Average	1	1	—	—	2	2	40	35	10	14	34	33	3	3	10	12

TABLE XXI

CWT. THEORETICAL 96° SUGAR PER ACRE PER MONTH FOR VARIETIES BY ECOLOGICAL GROUPS, 1960

Ecological groups	Varieties										
	B3439	B34104	B37161	B37172	B41227	B42231	B4362	Co331	Co421	Others	Average
Wet West	—	6·26	5·64	5·42	5·85	5·98	6·51	5·95	—	6·31	6·14
Dry North	3·95	4·61	4·89	6·05	5·00	5·38	5·15	4·91	4·95	4·72	4·93
Irrigated	6·28	5·39	4·89	—	6·12	5·77	6·78	—	—	6·28	6·19
Wet East	4·75	6·05	3·85	5·08	5·63	4·99	5·11	—	—	4·86	5·12
Central	—	—	6·61	—	7·13	6·45	7·05	—	—	7·00	7·03
Average	5·70	5·40	5·03	5·09	6·00	5·77	6·34	4·94	4·95	5·70	5·97

TABLE XXII

CWT. THEORETICAL 96° SUGAR PER ACRE PER MONTH FOR ESTATES BY CANE CLASS—CROP, 1960

Estates	Fall plants	Spring plants	Standover spring	1st ratoons	2nd ratoons	3rd ratoons	Old cane	Average
Appleton	8·97	7·38	—	7·50	7·20	6·82	6·58	7·02
Barnett	5·15	7·62	—	7·66	6·54	7·42	6·29	6·91
Bernard Lodge	7·17	6·48	—	5·76	5·59	4·73	5·38	5·89
Caymanas	6·28	6·26	—	6·13	5·53	5·90	6·15	6·09
Frome	—	6·80	—	6·57	5·86	5·21	5·36	5·83
Gray's Inn Central	2·03	4·39	—	3·69	4·04	3·86	4·34	4·05
Hampden	4·83	4·82	—	5·13	4·65	4·79	4·19	4·69
Holland	—	7·84	3·49	7·28	6·36	7·10	5·98	6·58
Innswood	—	7·39	—	6·64	6·45	5·67	5·47	6·22
Jamaica Sugar Estates	5·18	7·59	—	5·04	4·91	4·41	5·35	5·18
Monymusk	6·43	6·81	4·41	6·08	5·87	5·49	6·16	6·14
New Yarmouth	8·11	7·25	5·04	7·55	6·68	6·52	5·91	6·32
Richmond/Llandovery	4·69	5·85	—	5·76	5·63	5·56	5·62	5·65
Rose Hall	—	5·05	—	4·50	4·23	3·84	3·93	4·22
Serge Island	6·79	6·69	—	6·20	5·30	6·09	4·81	5·69
Sevens	7·63	7·38	—	7·19	6·92	7·61	6·12	7·04
Trelawny Estates	5·38	5·33	—	5·67	5·35	5·41	4·89	5·27
United Estates	7·29	7·48	—	7·08	6·09	6·59	6·25	6·57
Worthy Park	—	7·03	—	7·97	8·47	7·61	8·00	7·98
Average	6·23	6·66	4·61	6·28	5·80	5·62	5·67	5·97

TABLE XXIII

Distribution of Fertilizers

Acres Fertilized % Total Acres Reaped for Plants and Ratoons by Ecological Groups, 1956–60

Groups	Nitrogen		Phosphate		Potash	
	Plants	Ratoons	Plants	Ratoons	Plants	Ratoons
1956						
Wet West	98	99	28	13	97	96
North Coast	99	98	—	2	71	23
Irrigated	99	100	2	3	20	15
Wet East	88	98	11	10	51	41
Central	100	98	43	25	100	94
1957						
Wet West	91	97	22	12	86	95
North Coast	100	98	—	2	81	83
Irrigated	94	100	—	—	21	25
Wet East	95	98	1	11	50	38
Central	99	94	79	35	98	75
1958						
Wet West	96	98	18	8	94	97
North Coast	97	97	5	12	96	97
Irrigated	100	99	—	1	16	19
Wet East	93	100	36	14	57	41
Central	99	99	53	44	96	97
1959						
Wet West	98	99	28	19	96	97
North Coast	98	100	12	17	98	100
Irrigated	98	100	4	2	22	22
Wet East	85	98	22	12	54	46
Central	100	100	93	54	82	92
1960						
Wet West	97	99	46	21	97	98
North Coast	99	99	12	16	100	100
Irrigated	97	99	32	47	31	35
Wet East	96	97	26	15	60	54
Central	100	100	46	60	71	93

TABLE XXIV

Percentage Acreage Fertilized with Nitrogen for Each Cane Class, 1956–60

Crop year	Plants		Mean	Ratoons			
	Fall	Spring		1st	2nd	3rd	Old
1956	96	99	98	100	99	99	98
1957	96	94	95	99	99	99	98
1958	99	97	98	99	99	99	98
1959	90	98	94	99	99	99	99
1960	99	97	98	99	100	99	99

TABLE XXV

AVERAGE N, P_2O_5 AND K_2O APPLICATIONS FOR PLANTS AND RATOONS BY ECOLOGICAL GROUPS, 1956–60
(lb. per acre)

Groups	1956			1957			1958			1959			1960		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Wet West															
Plants	48	36	73	62	30	96	61	46	97	85	47	111	62	43	100
Ratoons	49	26	82	61	28	94	65	40	95	65	36	87	72	52	98
North Coast															
Plants	36	—	73	41	—	82	44	16	101	36	44	91	51	45	108
Ratoons	32	45	70	38	20	88	40	16	94	38	44	81	50	45	112
Irrigated															
Plants	105	56	89	97	—	76	100	—	81	93	61	88	98	57	90
Ratoons	97	52	96	102	54	95	101	49	95	99	27	98	99	36	90
Wet East															
Plants	68	32	76	77	33	108	70	75	108	74	49	78	75	55	65
Ratoons	77	31	91	79	23	88	84	66	96	78	40	72	78	39	66
Central															
Plants	71	32	85	56	39	88	75	27	87	70	30	84	70	29	87
Ratoons	71	26	93	72	39	88	76	21	88	76	27	95	79	22	89

TABLE XXVI

FERTILIZERS USED FOR EACH CANE CLASS

Cane class	NITROGEN				PHOSPHATE				POTASH			
	Acres fertilized	Tons N used	Mean lb. per acre	Acres fertilized % total acres reaped	Acres fertilized	Tons P_2O_5 used	Mean lb. per acre	Acres fertilized % total acres reaped	Acres fertilized	Tons K_2O used	Mean lb. per acre	Acres fertilized % total acres reaped
Fall plants	2,966	114	86	99	324	4	30	17	1,140	43	86	39
Spring plants	9,303	343	83	97	1,573	33	47	22	5,733	247	97	60
1st ratoons	12,891	471	82	99	2,317	37	36	23	8,925	368	92	70
2nd ratoons	11,623	423	81	100	1,702	25	33	19	7,589	325	96	61
3rd ratoons	6,889	254	83	99	1,042	16	35	18	4,512	178	88	58
Old canes	24,405	917	84	99	3,494	59	38	19	15,357	653	95	65
Totals	68,077	2,522	83	98	10,452	174	37	15	43,256	1,814	94	62

APPPENDIX II

PART 1

FACTORY DATA COMPARED BY CROPS

TABLE I

JUICE QUALITY—CROPS, 1956–60

	1956	1957	1958	1959	1960
Cane, pol %	12·78	12·43	12·15	11·76	11·59
Absolute juice—°Brix	17·92	17·70	17·49	17·01	16·90
Purity	82·98	81·89	80·97	80·10	79·63

TABLE II

MILLING FIGURES—CROPS, 1956–60

	1956	1957	1958	1959	1960
Tons cane per hour (TCH)	61·40	64·34	61·93	64·46	66·22
Tons fibre per hour (TFH)	8·66	9·17	8·80	9·15	9·42
Imbibition % fibre	126·78	127·71	127·58	131·14	122·25
Reduced pol extraction	94·99	94·72	95·01	94·65	94·46
Absolute juice lost % fibre (pol basis)	35·09	36·95	34·90	37·46	38·79
Pol % bagasse	2·55	2·60	2·60	2·48	2·52

TABLE III

LIME CONSUMPTION IN JAMAICAN FACTORIES—CROPS, 1956–60

	Lb. CaO/ton cane					Lb. CaO/ton non-pol				
	1956	1957	1958	1959	1960	1956	1957	1958	1959	1960
Monymusk	3·84*	4·90*	5·24*	3·35*	1·45	134·3*	157·83*	176·11*	108·97*	45·80
Richmond/Llandovery	1·78	1·64	1·48	1·82	1·33	75·7	68·42	50·80	73·46	56·88
Jamaica Sugar Estates	1·28	1·15	0·92	1·05	1·13	59·2	47·45	34·56	39·48	38·29
Frome	0·94	1·14	1·09	1·12	0·91	39·4	47·83	42·90	41·28	33·45
New Yarmouth	1·39	1·49	1·30	1·33	1·33	54·5	57·24	48·25	49·29	49·29
Caymanas	1·22	1·21	1·67	1·51	1·40	50·7	50·88	70·14	63·22	57·67
Innswood	0·98	0·78	0·89	1·16	1·15	44·7	31·23	34·02	43·45	40·30
Barnett	0·77	0·57	0·69	1·19	1·42	36·5	26·08	29·86	50·35	58·70
Worthy Park	1·16	1·56	1·23	1·28	1·00	58·8	77·16	56·19	56·19	47·11
Rose Hall	0·77	0·67	0·62	0·92	1·07	36·0	28·03	24·54	34·35	41·44
Gray's Inn Central	1·21	1·15	1·26	0·92	1·09	47·1	40·86	45·28	34·71	41·09
Sevens	1·05	1·39	0·69	1·11	1·05	45·4	55·93	25·69	38·37	37·39
United Estates	1·05	0·99	1·45	0·90	1·23	47·1	45·83	63·08	36·48	49·54
Serge Island	1·66	1·50	2·09	1·50	1·39	83·7	74·69	96·72	49·77	62·58
Vale Royal	1·23	1·42	0·96	0·95	0·64	60·3	61·19	41·33	39·29	26·45
Appleton	1·25	0·66	0·89	1·62	0·62	58·8	30·07	37·99	73·38	29·24
Hampden	0·73	1·04	0·69	0·64	0·80	36·8	45·41	27·50	28·21	31·50
Bernard Lodge	1·60	1·41	1·44	1·53	1·43	69·9	59·40	56·70	54·72	55·67
Holland	1·01	1·04	1·39	1·32	0·80	38·3	40·28	46·95	47·80	32·15
Long Pond	1·95	1·88	1·78	1·62	0·65	96·0	84·93	77·96	76·97	26·03

* Includes Refinery Consumption.

TABLE IV

HEATER CAPACITIES—JAMACIAN FACTORES—CROPS, 1956–60

Factory	Cu. ft. M.Jc/sq. ft. H.S./hr.				
	1956	1957	1958	1959	1960
Monymusk	0·97	0·95	0·92	0·99	1·00
Richmond/Llandovery	1·32	1·15	1·29	1·10	1·14
Jamaica Sugar Estates	1·31	1·34	1·27	1·33	0·87
Frome	0·78	1·01	0·96	0·96	0·90
New Yarmouth	1·15	1·11	1·13	1·22	1·25
Caymanas	0·95	0·96	0·92	1·00	0·93
Innswood	1·16	0·82	1·83	0·93	0·56
Barnett	1·15	0·81	0·77	0·82	0·86
Worthy Park	1·10	0·74	0·76	0·85	0·89
Rose Hall	0·54	0·77	0·82	0·79	0·80
Gray's Inn Central	1·01	0·97	1·00	1·02	1·00
Sevens	0·89	1·04	1·05	1·07	1·07
United Estates	0·88	0·84	0·82	0·84	0·80
Serge Island	0·95	0·95	1·13	0·88	0·91
Vale Royal	1·03	0·78	0·82	0·79	0·83
Appleton	0·84	0·97	0·99	0·97	1·09
Hampden	0·84	1·60	1·57	1·95	1·95
Bernard Lodge	0·97	1·00	0·96	1·00	0·71
Holland	0·45	0·72	0·63	0·70	0·79
Long Pond	0·62	0·67	0·59	0·67	0·83

TABLE V

ROTARY FILTER PERFORMANCE—CROPS, 1956–60

Factory	Sq. ft. FA/TCH					Pol in cake % pol in cane				
	1956	1957	1958	1959	1960	1956	1957	1958	1959	1960
Monymusk	3·77	3·70	3·81	3·63	3·52	0·49	0·54	0·60	0·63	0·49
Richmond/Llandovery	—	—	—	—	4·08*	0·56	0·69	0·78	0·69	0·60*
Jamaica Sugar Estates	—	—	—	4·94	5·17	0·56	0·53	0·56	0·27	0·62
Frome	3·79	3·70	3·88	3·78	3·83	0·21	0·20	0·22	0·23	0·23
New Yarmouth	4·74	4·92	4·73	4·71	4·43	0·43	0·60	0·58	0·64	0·58
Caymanas	5·23	5·22	5·22	4·65	4·48	0·46	0·43	0·51	0·37	0·47
Innswood	3·82	3·58	3·45	3·33	3·25	0·26	0·27	0·35	0·34	0·26
Barnett	4·92	4·72	5·03	4·87	4·54	0·36	0·37	0·58	0·52	0·51
Worthy Park	—	—	—	—	2·95*	0·49	0·64	0·55	0·53	0·48*
Rose Hall	5·75	5·40	5·37	5·50	5·27	0·39	0·37	0·24	0·28	0·29
Gray's Inn Central	6·33	6·49	6·37	6·34	6·40	0·46	0·69	0·56	0·67	0·54
Sevens	3·52	3·21	3·25	3·16	3·09	0·26	0·39	0·38	0·37	0·41
United Estates	3·20	3·21	3·28	3·26	3·14	0·33	0·54	0·50	0·44	0·46
Serge Island	8·19	8·37	8·01	6·88	6·64	0·80	0·67	0·46	0·40	0·42
Vale Royal	6·04	5·63	5·43	5·54	5·51	0·43	0·35	0·44	0·82	0·45
Appleton	3·84	3·22	3·23	3·18	2·66	0·23	0·25	0·28	0·29	0·37
Hampden	5·51	5·57	5·63	5·20	4·98	0·76	0·62	0·92	0·65	0·73
Bernard Lodge	5·22	5·17	5·28	4·90	4·31	0·26	0·44	0·51	0·44	0·28
Holland	—	—	—	—	5·78*	0·48	0·54	0·63	0·60	0·66*
Long Pond	—	—	—	—	4·10*	0·52	0·51	0·48	0·51	0·50*

*Filter Presses.

TABLE VI

FILTER STATION CONTROL FIGURES—CROPS, 1956–60

	1956	1957	1958	1959	1960
Pol % mud	2·06	2·11	2·27	2·01	1·85
Mud % cane	2·51	2·55	2·49	2·60	2·68
Pol in mud % pol in cane ..	0·40	0·43	0·47	0·44	0·43

TABLE VII

EVAPORATION RATES (AS LB. EVAP./SQ. FT. H.S./HR.)—CROPS, 1956–60

Factory	°Brix syrup					Lb./sq. ft. H.S./hr.				
	1956	1957	1958	1959	1960	1956	1957	1958	1959	1960
Monymusk	57·87	57·76	55·90	55·87	56·09	6·99	6·87	6·69	7·25	7·32
Richmond/Llandovery	59·99	61·24	65·87	66·92	64·66	7·13	6·89	8·39	7·22	7·42
Jamaica Sugar Estates..	57·41	62·14	58·64	61·31	58·59	6·33	6·63	6·05	6·43	6·21
Frome	57·63	54·43	59·18	60·04	58·37	7·67	7·70	7·41	7·57	6·97
New Yarmouth	62·99	60·36	61·76	61·20	61·68	7·40	7·16	6·54	7·13	6·95
Caymanas	64·12	61·39	62·33	63·11	62·52	4·59	4·57	4·49	4·83	5·12
Innswood	56·42	57·20	58·27	59·07	60·10	6·66	7·08	6·36	7·20	8·15
Barnett	59·40	57·67	57·17	58·14	55·20	8·26	8·30	7·75	8·55	8·97
*Worthy Park	62·40	53·11	61·51	58·84	57·08	6·15	6·16	6·77	7·49	7·67
Rose Hall	61·53	58·97	65·42	63·28	62·14	8·45	6·46	6·67	6·43	6·56
Gray's Inn Central ..	56·25	59·52	57·51	61·05	62·81	5·70	5·42	5·76	6·00	5·98
Sevens	65·47	62·06	66·90	67·08	65·63	6·75	7·00	7·22	7·30	7·35
United Estates ..	68·19	69·14	67·45	66·03	65·91	9·87	10·02	9·54	9·79	9·20
Serge Island	54·32	53·33	57·31	61·25	63·61	8·06	7·89	8·82	7·56	8·02
Vale Royal	59·28	62·05	59·95	60·20	60·67	7·63	8·13	8·57	8·66	8·22
*Appleton..	58·26	57·57	64·36	60·46	65·25	7·61	9·23	6·92	6·93	7·93
Hampden	60·22	60·91	59·41	65·31	66·05	7·75	7·89	8·04	6·98	6·99
Bernard Lodge ..	65·46	62·26	64·30	62·33	62·66	5·57	5·61	5·48	5·59	6·32
Holland	57·35	62·43	61·08	61·01	60·16	5·05	5·65	4·92	5·54	6·20
*Long Pond	56·20	52·49	51·83	54·24	56·80	8·48	7·52	7·01	8·30	5·28

* Quintuple effects.

TABLE VIII

POLARIZATIONS, MOISTURES, SAFETY FACTORS AND PERMISSIBLE MOISTURES—EXPORT SUGAR—CROPS, 1956–60

Factory	°Polarization					% Moisutre				
	1956	1957	1958	1959	1960	1956	1957	1958	1959	1960
Monymusk	97·97	97·09	97·03	96·75	97·69	0·58	0·67	0·75	0·77	0·53
Richmond/Llandovery	96·70	—	—	—	—	0·87	—	—	—	—
Jamaica Sugar Estates	97·58	—	97·18	97·14	97·06	0·94	—	0·93	—	0·94
Frome	96·87	96·75	96·82	96·51	96·55	0·82	0·73	0·76	0·83	0·79
New Yarmouth	97·74	97·71	97·44	97·40	97·49	0·55	0·60	0·72	0·75	0·59
Caymanas	97·38	97·52	97·24	97·44	96·87	—	0·80	0·80	0·84	0·78
Innswood	97·09	97·20	97·13	96·44	96·30	0·86	0·85	0·71	0·90	0·84
Barnett	97·64	97·80	97·28	97·32	97·13	0·96	0·80	0·72	0·73	0·79
Worthy Park	97·11	97·12	97·20	96·62	96·92	0·99	1·00	0·99	0·90	0·80
Rose Hall	97·25	97·12	97·18	97·02	96·81	0·80	0·85	0·82	0·82	0·81
Gray's Inn Central	97·21	97·33	96·81	97·00	96·98	0·87	0·80	0·85	0·83	0·70
Sevens	97·33	97·54	97·25	96·55	97·43	0·65	0·64	0·66	0·81	0·66
United Estates	97·70	97·58	97·43	97·13	97·17	0·84	0·72	0·75	0·77	0·77
Serge Island	97·08	97·32	97·32	97·79	97·73	0·96	0·96	0·79	0·65	0·68
Vale Royal	97·12	97·19	—	—	96·79	0·64	0·68	—	—	0·71
Appleton	97·08	97·01	97·31	97·65	97·26	0·84	0·84	0·84	0·78	0·81
Hampden	98·18	98·02	97·58	97·84	97·11	0·88	0·91	0·82	0·76	0·76
Bernard Lodge	97·47	97·72	97·56	97·02	97·09	—	—	0·86	0·98	0·81
Holland	96·91	97·12	96·49	96·58	96·16	0·84	0·84	0·81	0·90	1·02
Long Pond	97·58	97·22	97·48	97·40	97·21	0·64	0·64	0·64	0·64	0·66

Factory	Safety factor					Permissible % moisture				
	1956	1957	1958	1959	1960	1956	1957	1958	1959	1960
Monymusk	0·286	0·230	0·253	0·236	0·229	0·51	0·73	0·74	0·59	0·58
Richmond/Llandovery	0·264	—	—	0·265	—	0·83	—	—	0·88	—
Jamaica Sugar Estates	0·390	—	0·330	0·301	0·320	0·61	—	0·73	0·72	0·74
Frome	0·262	0·225	0·239	0·237	0·229	0·78	0·81	0·80	0·88	0·86
New Yarmouth	0·243	0·262	0·281	0·291	0·235	0·57	0·57	0·64	0·64	0·63
Caymanas	—	0·323	—	0·354	0·249	0·66	0·62	—	0·84	0·78
Innswood	0·296	0·304	0·247	0·253	0·227	0·73	0·70	0·72	0·89	0·93
Barnett	0·407	0·364	0·265	0·272	0·275	0·59	0·55	0·68	0·66	0·72
Worthy Park	0·343	0·347	0·354	0·263	0·260	0·72	0·72	0·70	0·79	0·77
Rose Hall	0·291	0·295	0·291	0·275	0·254	0·69	0·72	0·71	0·75	0·80
Gray's Inn Central	0·312	0·300	0·266	0·252	0·232	0·70	0·67	0·80	0·83	0·76
Sevens	0·243	0·260	0·240	0·234	0·257	0·67	0·62	0·69	0·87	0·64
United Estates	0·365	0·298	0·292	0·265	0·272	0·58	0·61	0·64	0·72	0·71
Serge Island	0·329	0·358	0·295	0·294	0·300	0·73	0·67	0·67	0·55	0·57
Vale Royal	0·222	0·242	—	0·238	0·221	0·72	0·70	—	0·72	0·80
Appleton	0·288	0·281	0·312	0·283	0·296	0·73	0·75	0·67	0·74	0·69
Hampden	0·484	0·460	0·339	0·350	0·263	0·46	0·50	0·61	0·54	0·72
Bernard Lodge	—	—	0·352	0·329	0·278	0·63	0·57	0·61	0·76	0·73
Holland	0·272	0·292	0·231	0·263	0·266	0·77	0·72	0·88	0·86	0·96
Long Pond	0·264	0·230	0·254	0·246	0·237	0·61	0·70	0·63	0·65	0·70

TABLE IX

% GROSS GRINDING TIME—CROPS, 1956–60

	1956	1957	1958	1959	1960
Non-factory stoppages	15·41	20·47	19·91	20·39	20·16
Factory stoppages	7·66	7·84	7·93	7·17	8·72
Time grinding	76·93	71·69	72·16	72·44	71·12

TABLE X

Pol Balance (% Pol in Cane)—Crops, 1956–60

	1956	1957	1958	1959	1960
Pol in sugars	84·82	83·39	82·72	82·26	81·44
Pol in bagasse	5·75	6·14	6·29	6·20	6·43
Pol in molasses	7·64	8·06	8·70	9·05	9·47
Pol in filter cake	0·40	0·43	0·47	0·44	0·43
Pol in undertermined	1·39	1·98	1·82	2·05	2·23

TABLE XI

Comparative Control Figures—Crops, 1956–60

	1956	1957	1958	1959	1960
Pol % cane	12·78	12·43	12·15	11·76	11·59
Mixed juice—purity	83·38	82·29	81·82	80·50	80·05
Tons cane/ton 96° sugar	8·86	9·26	9·50	9·89	10·13
Boiling house efficiency (W.C.)	97·78	97·22	96·36	97·09	96·68
Pol in sugars % pol in cane	84·48	83·39	82·72	82·26	81·44
Pol in molasses % pol in cane	7·64	8·06	8·70	9·05	9·47

TABLE XII

Molasses Factors—Crops, 1956–60

Factory	1956	1957	1958	1959	1960
Monymusk	44·11	46·14	46·85	43·07	44·46
Richmond/Llandovery	40·49	39·40	38·84	43·05	38·95
Jamaica Sugar Estates	39·30	40·04	40·49	37·88	33·64
Frome	38·64	37·02	36·89	37·42	38·08
New Yarmouth	37·61	37·44	38·28	40·86	37·93
Caymanas	38·92	40·05	43·23	46·40	43·71
Innswood	49·76	45·55	31·51	35·70	39·84
Barnett	37·74	38·01	42·82	39·66	39·13
Worthy Park	37·90	37·89	40·71	39·31	39·58
Rose Hall	38·71	36·13	38·48	37·39	40·52
Gray's Inn Central	40·42	36·44	44·79	40·59	38·23
Sevens	40·68	39·28	40·33	39·91	39·74
United Estates	37·88	40·86	41·97	41·64	42·87
Serge Island	45·03	42·33	41·65	41·33	46·21
Vale Royal	36·69	36·18	40·11	38·86	39·66
Appleton	30·03	40·35	31·89	33·09	25·46
Hampden	48·53	38·96	45·12	44·08	46·12
Bernard Lodge	38·16	42·51	42·38	38·81	43·32
Holland	35·70	39·00	44·45	40·10	52·38
Long Pond	36·80	36·78	39·09	38·20	37·93

TABLE XIII

Quality of Cane Supplied to Jamaican Factories, Expressed as Possible Tons Cane/Ton 96° Sugar

(Calculated on a basis of assumed Mill Extraction of 96·50, a B.H.E. (Winter Carp) of 100 and Pol % Cane and Purity of Mixed Juice as reported.)

(Calculated on Copp's Tables—Spencer Meade, page 762.)

Factory	1956	1957	1958	1958	1960	5-Year averages
Monymusk	8·85	9·41	9·94	10·53	10·13	9·77
Richmond/Llandovery	8·49	8·35	10·69	9·41	9·50	9·29
Jamaica Sugar Estates	8·84	8·73	9·53	9·72	10·65	9·49
Frome	8·07	8·89	8·30	9·62	9·20	8·82
New Yarmouth	8·22	8·69	9·24	8·96	9·23	8·87
Caymanas	8·48	8·46	9·59	9·33	9·21	9·01
Innswood	8·48	8·43	9·61	9·08	9·35	8·99
Barnett	7·86	8·10	7·89	8·51	9·11	8·29
Worthy Park	7·08	7·15	7·35	7·58	7·49	7·33
Rose Hall	7·82	8·46	8·22	8·99	9·90	8·68
Gray's Inn Central	9·67	9·12	10·63	10·71	10·92	10·21
Sevens	8·55	8·65	9·08	8·98	9·48	8·95
United Estates	7·81	7·96	8·00	8·42	8·85	8·21
Serge Island	8·11	7·90	8·00	8·21	8·51	8·15
Vale Royal	8·44	8·47	8·89	9·59	10·83	9·24
Appleton	7·79	8·31	7·77	8·05	8·08	8·00
Hampden	7·64	8·09	8·68	8·98	9·78	8·63
Bernard Lodge	8·23	8·08	8·83	8·67	9·09	8·58
Holland	8·84	8·36	8·82	8·98	8·78	8·76
Long Pond	8·77	8·81	9·23	9·99	10·82	9·52
Island Averages	8·35	8·65	8·88	9·25	9·42	8·91

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PART 2

FACTORY DATA—1960 CROP

TABLE 1

FACTORY EQUIPMENT DATA—1960 CROP

(As Reported by the Factories)

Factories	Width Carrier	Knives			Crushers and Mills	Total Rolls	Remarks
		Setts	Blades/Sett	H.P.			
Monymusk	78″	2	38/38	200/200	3 RC 35½″ × 78″, 15 RM 35″ × 78″	18	For 1960 Crop: Air preheaters, induced draught fans and chimney for furnaces of 2 boilers. Modifications to refinery for continuous instead of batch carbonatation including installation of 2 Auto Filters and modifications to pumps to handle higher brix liquors. Fork lift trucks and pallettes for handling refined sugar in bags. Foxboro control of liming of raw juice, and change from hot to cold liming. Automation of mixed juice weighing, using pneumatic system. Pressure gauges, 24″ diameter graduated in feet and inches of water for determining final molasses weights. 4 Pot Still Calandrias each 265 sq. ft. H.S.
Richmond/Llandovery	41″	1	22	90	12 RM 22″ × 42″, 6 RM 24″ × 42″	18	For 1960 Crop: H.P. of Knife Engine increased from 40 to 90.
Jamaica Sugar Estates	60″	2	30/30	90/150	2—2 RC 30″ × 60″, 12 RM 30″ × 60″	16	For 1960 Crop: 1 600 kW. Turbo-Alternator, 2 1,200 sq. ft. Juice Heaters, 3 Thomson Eisner F.D. Furnaces, 1 Kennicott Thompson Water Treatment Plant, 1 Tramp Iron Magnet and Reheat coils in pug mill for C Massecuite.
Frome	78″	4	38	2 at 200 2 at 300	(2 Tandems of 15 Rolls each) 3 RC 35½″ × 78″, 12 RM 35″ × 78″	15	For 1960 Crop: 2-Crane gantry for cane handling, extended carrier house to accommodate second cane carriers and knives, etc., 15 roller 35″ × 78″ milling plant complete, 3 B & W 6300 H.S., W.I.F. type boilers complete with bagasse carriers, etc., Foxboro juice weighing equipment, 1 8′ × 9′ Oliver Filter, 1 1,600 sq. ft. H.S. Juice Heater, 2 7,500 sq. ft. H.S. evaporator vessels, 2 1,000 cu. ft. vacuum pans, 1 seed receiver, 9 42″ × 24″ Broadbent Centrifugals, 1 Film Cooling Tower, 1 1,000 kW. Turbo Alternator, 1 268 kW. Diesel Alternator and 2 2,000 gal. Calandria Pot Stills. For 1961 Crop: Pre-heater—2,390 sq. ft. H.S. 1 Clarifier—Rapi-Dorr, approx. 9,000 cu. ft. cap., 2 additional 42″ × 24″ Broadbent centrifugals. Primary saveall to No. 4 vessel of 30,000 sq. ft. H.S. evaporator. Replacements: New calandria complete and 1st vapour belt for No. 1 vessel / New calandria complete for No. 2 vessel } 20,000 sq. ft. H.S. evap.
New Yarmouth	52″	2	26/36	150/140	3 RC 28½″ × 54″, 3 RM 27 3/8″ × 54″, 9 RM 27″ × 54″	15	No change.
Caymanas .. .	48″	1	32	150	3 RC 27″ × 48″, 12 RM 25″ × 48″	15	For 1960 Crop: new 750 sq. ft. H.S. Vacuum Pan and new 12″ × 24″ Dry Air Pump. For 1961 Crop: 1 cl. juice heater approx. 500 sq. ft. H.S.
Innswood . ..	42″	2	24/24	75/100	3 RC 24″ × 42″, 12 RM 24″ × 42″	15	For 1961 Crop: 1 24 × 42 electrically-driven Centrifugal Basket, 1 Pre-Evaporator of 3,500 sq. ft. H.S. Additional Tray to the Dorr Clarifier. Erection of new Cross Carrier for conveying sugar from inside Bin to outside Bin.
Barnett .. .	40″	2	24/48	75/120	3 RC 23″ × 36″, 12 RM 22″ × 36″	15	For 1960 Crop: converting one natural cooled crystallizer to water cooled. 3 Liptak arches for furnaces replaced burnt out arches. 3 Oil burners for furnaces. Worked satisfactorily. For 1961 Crop: 100 kW. Steam Alternator converting crane to electric drive changing evaporator from Qudruple to Triple Effect. Partial Electrification of Factory (pumps, etc.).
Worthy Park . ..	42″	1	24	45	3 RC 22½ × 42″, 3 RM 22½″ × 42″, 9 RM 24″ × 42″	15	For 1960 Crop: Filter Press Filtering Area increased from 960 to 1,160 sq. ft. Meinicke chute was installed with very good results. For 1961 Crop: New knife engine and knife. 2 Juice pumps. Rotary filter. 2 mills.
Rose Hall . ..	38″	1	26	75	15 RM 24″ × 42″	15	For 1960 Crop: 2 locally made Calandrias for 2 1,500 gal. Pot Stills. 2 Oil burners for furnaces. Factory will be closed down permanently.
Gray's Inn Central ..	60″	1	10	20	2 RC 26″ × 60″, 12 RM 30″ × 60″	14	For 1960 Crop: One W.T. Boiler, Full Electronic Control Evaporator, °Brix Evershed, Steam Vignol and 90 kW. Diesel Generator. For 1961 Crop: Oil firing on W.T. boilers. New switch board in power house. Flow and automatic pH control. Transmission Boiling Recorders on pans and temp. control on No. 2 pan. Replacement programme of wooden vats with steel vats. Strength recorder and controller for alcohol. Florators for alcohol and heads.

TABLE I—*continued*

Factories	Width Carrier	Knives			Crushers and Mills	Total Rolls	Remarks
		Setts	Blades/Sett	H.P.			
Sevens	54″	1	26	200	12 RM 32″ × 60″	12	For 1960 Crop: Edwards hydraulic accumulators on first and second mills. Bagasse storage shed and Automatic control valve for boiler fans. Replace coils in stills with calandrias; replace 12 wooden fermenting tanks by 6 steel tanks. Gear Bed and Gearing for Nos. 3 and 4 Mills. For 1961 Crop: Gantry for off loading and storing road cane. Hydraulically operated dumper for rail cars. Second hand Mill Engine 30 × 60 to replace existing No. 1 Mill Engine. Enlargement of one Vacuum Pan from 400 to 550 cu. ft. Individual Condensers for all Vacuum Pans.
Bybrook	39″	1	24	75	3 RM 25½″ × 42″, 3 RM 26½″ × 42″, 6 RM 24″ × 42″	12	For 1960 Crop: 1 complete Savalle W.T., 2 Continuous Stills with Rectifier, Boiling and Stripping columns of 1,800 gal., Rum 124 hour capacity. 3 50-ton capacity Bulk Sugar Bins. Murray Turbine driving through Lufkin reduction gears No. 1 and No. 2 Mills. One pre-heater of 230 sq. ft. H.S. 2 Schoette Koerting Barometric Leg Multijet condensers for No. 1 and No. 2 Vacuum Pans. Manually operated sugar plough for low grade—not successful. Continuous treatment for acidifying, heating and deliming of molasses. For 1961 Crop: Injection water pump Demming 3,800 U.S.G. P.M. at 70′ Total Head. No. 3 Pan modified with split coils of 670 sq. ft. H.S. and enlarged to 400 cu. ft. capacity, working on vapour and exhaust steam. No. 3 and No. 4 vessels of Evaporator modified to 1,837 sq. ft. H.S. each.
Serge Island	48″	1	22	220	3 RC 26″ × 48″, 9 RM 24″ × 48″	12	For 1960 Crop: Installation of Derrick type cane crane. Cane Feeder carrier (additional) being built at site. New first motion gearing to speed up mills. For 1961 Crop: 10 ft. dia. Ca. Vac. Pan being erected, 7′ 0″ dia. Coil Vac. Pan being taken out and discarded. Three Vac. Pans being elevated 4′ 0″ and resited. Jet Condenser being fitted to Evap. and water pump for same being installed with alternate steam/electric drive. Larger water supply piping being installed. New piping and guttering throughout Vac. Pan/Crystallizer/Centrifugal station being fitted and massecuite pumps relocated. Two remaining "air-cooled" "C" crystallizers being converted to "water-cooled." Ribbon screw conveyor to replace mingler under "C" centrifugal.
Vale Royal	42″	1	30	75	12 RM 24″ × 42″	12	No change. Factory and distillery will be closed down permanently.
Appleton	42″	1	52	125	3 RC 26″ × 42″, 9 RM 25″ × 42″	12	For 1960 Crop: New Steam Turbine for Milling Plant and for No. 2 Knives. For 1961 Crop: No. 1 Boiler to be rebuilt with ward setting. New Evaporator 5th Vessel 2,600 sq. ft. H.S. New Rum Column of 2,000 g.p.h. wash capacity.
Hampden	44″	2	20/16	50/100	6 RM 24″ × 48″, 6 RM 25″ × 48″	12	For 1960 Crop: New Turbine for Power House 300 kW. Generator. Electrification of Injection Water Pump Drive, and installation of auxiliary Oil Firing Equipment.
Bernard Lodge ..	87″	2	42/42	180/100	2 RC 34″ × 87″, 6 RM 38″ × 84″, 3 RM 39″ × 84″	11	For 1960 Crop: John Thompson Boiler. Vibrating Screen (Link Belt). Maxwell Bologne Juice Scale. 5 Pott. Cassells Waterdriven Centrifugals. Richard Simon Sack Filling and weighing Machine. Pneumercator for Molasses.
Holland..	36″	1	40	100	2 RC 21″ × 36″, 9 RM 22″ × 36″	11	No Change.
Long Pond ..	43″	1	33	60	9 RM 24¾″ × 48″	9	For 1960 Crop: Boilers to be re-arranged, Nos. 1 and 2 to be coupled and H.S. increased to 8,646. Existing Spray Pond to be demolished and replaced by a Film Cooling Tower. An extra Evaporator of 4,600 sq. ft. H.S. will be installed as first vessel of existing Quad. For 1961 Crop: Calandrias instead of coils in pot-stills. Factory to be re-equipped to double the capacity.

TABLE II

Factory Stations Capacities—1960 Crop

		Mony-musk	Rich-mond/ Llan-dovery	Jamaica Sugar Estates	Frome	New Yar-mouth	Cay-manas	Inns-wood	Bar-nett	Worthy Park	Rose Hall	Gray's Inn Central	Sevens	By-brook	Serge Island	Vale Royal	Apple-ton	Hamp-den	Ber-nard Lodge	Holland	Long Pond
Per Ton Cane per Hour:																					
Boilers																					
As Water Tube	sq. ft. H.S.	260	261	403	241	297	333	291	288	272	281	310	331	263	279	229	317	261	354	424	253
Superheater	sq. ft. H.S.	42	—	63	39	50	—	—	24	—	—	7	—	—	—	—	31	—	6	—	—
Juice Heaters	sq. ft. H.S.	28	28	35	34	24	33	54	35	36	37	29	29	36	33	38	28	16	41	37	37
Filters																					
Presses	sq. ft. F.A.	—	41	—	—	—	—	—	—	30	—	—	—	—	—	—	—	—	—	58	41
Rotary	sq. ft. F.A.	3·52	—	5·17	3·83	4·43	4·48	3·25	4·54	—	5·27	6·40	3·09	3·14	6·64	5·51	2·66	4·98	4·31	—	—
First Subsiders	.. ..	42	75	81	59	94	83	58	91	51	70	72	50	60	117	77	53	66	72	—	73
Continuous	cu. ft. ..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	94	—
Intermittent	cu. ft. ..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	—
Second Subsiders																					
Intermittent	cu. ft. ..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Evaporators																					
Cl. Juice Heaters	sq. ft. H.S.	9·38	12·56	7·38	—	9·06	—	11·90	10·59	11·45	12·76	—	—	9·63	—	10·97	7·81	—	6·46	—	—
As Quad	sq. ft. H.S.	183	223	244	212	209	303	184	160	*196	229	243	213	158	188	183	*194	227	226	231	282
Per Ton Commercial Sugar per Hour:																					
Evaporators																					
As Quad	sq. ft. H.S.	2,057	2,230	2,811	2,080	2,074	3,004	1,844	1,592	*1,571	2,509	2,851	2,220	1,522	1,745	2,141	*1,789	2,628	2,278	2,381	* 3,543
Vacuum Pans																					
As Calandria	sq. ft. H.S.	553	208	691	427	470	594	539	489	340	—	767	357	389	408	514	408	482	618	357	597
	cu. ft. ..	395	299	434	291	352	374	382	402	271	338	492	265	233	262	328	—	291	369	417	386
Syrup Tanks	cu. ft. ..	205	157	262	146	211	231	130	175	109	165	322	128	155	241	193	149	194	434	233	235
A and B Molasses Tanks	cu. ft. ..	546	440	523	280	297	231	445	365	388	397	783	344	315	444	379	418	299	651	619	376
Crystallizers																					
Natural Cooling	cu. ft. ..	—	619	601	—	247	—	491	814	337	—	492	—	242	413	—	424	230	325	501	—
Air Cooled (Pit.)	cu. ft. ..	—	—	—	—	—	—	—	—	—	588	—	—	—	—	1,370	—	—	—	—	1,103
Water Cooled	cu. ft. ..	525	453	1,002	320	529	463	510	486	—	588	1,163	669	484	343	—	372	403	325	714	—
	sq. ft. C.A.	194	197	152	119	70	—	15	—	—	233	341	197	242	103	—	—	249	—	—	—
Total Installed:																					
Pug Mill L.G. Sugars																					
	cu. ft. ..	574	75	149	—	550	—	102	80	—	—	84	67	58	90	—	2,600	—	—	—	320
Water Heated	sq. ft. ..	—	—	202	—	—	—	—	—	—	—	—	14	—	—	—	—	—	—	—	—
Vapour Heated	sq. ft. ..	—	—	—	—	—	—	15	—	55	—	—	—	118	—	—	—	—	—	—	—
Centrifugals																					
High Grade Sugars	No. Off...	8	6	6–11	18	4	8	3	6	5	4	6	6	6	6	7	2	3	5	3	2
Size: Height	in. ..	20	18	20–24	24	24	18	24	18	18	18	18	18	18	18	14	24	24	24	18	20
Diameter	in. ..	42	30	42–42	42	40	36	42	30	36	36	36	36	30	36	30	49	42	48	30	42
Operating Speed	r.p.m. ..	1,200	1,200	1,000–1,000	1,000	50–850–1,750	1,000	1,200	1,100	1,200	1,200	1,220	1,200	1,300	1,000	1,200	1,200	1,200	1,200	1,200	1,020*–1,080
Gravity Factor	.. ..	860	615	595–595	595	1,675	510	860	515	735	735	760	735	720	510	615	1,000	860	980	615	620–695
Low Grade Sugars	No. Off. ..	12	6	8	9	4	4	3	6	3	5	7	6	4	3	5	5	3	4	3 2	2
Size: Height	in. ..	20	18	6 × 20 2 × 24	24	24	20	24	18	18	18	18	18	18	20	18	24	24	24	24 18	20
Diameter	in. ..	42	30	42	42	40	42	42	30	36	30	36	36	36	42	30	40	40	42	40 30	42
Operating Speed	r.p.m. ..	1,200	1,200	6@1,000 2@750–1,500	1,500	1,650	1,300	1,300	1,100	1,200	1,200	1,140	1,200	1,200	1,000	1,200	1,000	1,800	1,400	1,000 1,200	1,020–1,080
Gravity Factor	.. ..	860	615	595–1,340	1,340	1,550	1,010	1,010	515	735	615	665	735	735	595	615	565	1,840	1,170	565 615	670–695
Affination	No. Off. ..	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Size: Height	in. ..	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Diameter	in. ..	42	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Operating speed	r.p.m. ..	1,200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Gravity Factor	.. ..	860	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Refinery	No. Off. ..	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Size: Height	in. ..	20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Diameter	in. ..	42	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Operating Speed	r.p.m. ..	1,200	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Gravity Factor	.. ..	860	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

* Quintuple.

TABLE III

Factory Quantities—1960 Crop

	Mony-musk	Rich-mond/ Llan-dovery	Jamaica Sugar Estates	Frome	New Yar-mouth	Cay-manas	Inns-wood	Bar-nett	Worthy Park	Rose Hall	Gray's Inn Central	Sevens	By-brook	Serge Island	Vale Royal	Apple-ton	Hamp-den	Ber-nard Lodge	Holland	Long Pond	Totals and Averages
Tons Cane:																					
Estate Ground	667,441	56,190	86,567	413,825	49,873	130,864	94,607	35,127	47,624	29,659	63,386	117,133	94,342	66,793	98,704	95,852	65,038	160,178	52,325	37,718	2,463,246
Purchased Ground ..	175,082	2,887	62,987	440,153	224,772	14,999	96,223	51,958	43,619	28,505	89,223	119,553	79,405	60,478	49,803	80,815	118,414	78,275	9,750	35,739	1,862,640
Total Ground	842,523	59,077	149,554	853,978	274,645	145,863	190,830	87,085	91,243	58,164	152,609	236,686	173,747	127,271	148,507	176,667	183,452	238,453	62,075	73,457	4,325,886
Total for Sugar Manuf. ..	841,007	59,077	149,554	853,721	274,645	145,863	190,830	87,085	91,243	58,164	152,609	236,686	173,747	127,271	148,507	171,653	173,090	238,434	62,075	70,434	4,305,695
Grd. for Other Purposes ..	*1,516	—	—	257	—	—	—	—	—	—	—	—	—	—	—	5,014	10,362	19	—	3,023	20,191
Bagasse:																					
Estimated Surplus Tons	—	—	—	4,638	123	25	211	—	—	—	1,200	50	—	50	—	—	—	—	—	—	6,297
Fuel:																					
Factory:																					
Wood used Tons	81	1,100	—	763	120	840	163	1,200	175	2,538	—	800	—	100	—	103	1,217	—	3,188	300	12,688
Oil used Gal.		—	—	—	38,877	103,200	—	255,603	—	98,244	—	199,700	86,464	3,000	—	271,500	198,050	141,500	—	18,775	1,414,913
Distillery:																					
Wood used Tons	—	—	—	—	—	—	407	—	—	—	—	—	—	—	—	—	—	—	—	—	407
Oil used Gal.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Locomotive:																					
Wood used Tons	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Oil used Gal.	—	—	88,080	30,879	—	—	2,655	—	—	—	—	—	—	—	—	—	—	—	—	—	121,614
Factory																					
Wood/Ton 96° Sugar ..	0·001	0·184	—	0·009	0·004	0·056	0·009	0·135	0·115	0·474	—	0·035	—	0·007	—	0·005	0·076	—	0·528	0·050	0·037
Oil/Ton 96° Sugar ..	—	—	—	—	1·379	6·915	—	28·674	—	18·339	—	8·635	4·711	0·213	—	14·026	12·307	5·880	—	3·153	7·936
Filter Cake Tons	27,201	971	4,765	20,708	8,117	4,486	3,728	3,052	1,330	885	3,347	7,149	4,775	3,166	2,849	5,087	4,890	7,116	850	761	115,233
Molasses Gal.	5,937,859	285,097	845,430	4,847,800	1,523,321	781,731	1,165,573	422,145	382,830	333,516	864,650	1,467,233	962,230	714,330	821,895	767,985	1,109,836	1,292,453	334,500	372,285	25,232,699
Lime, Burnt lb.	1,219,105	78,400	169,470	776,968	364,421	204,820	218,898	123,410	90,924	62,115	166,096	248,400	210,250	133,878	94,716	106,021	139,243	341,146	49,480	45,769	4,843,530
Separan A.30	—	—	—	—	—	125	—	—	—	—	—	—	—	—	—	—	—	—	—	—	125
Phosphate	—	—	—	—	—	—	—	—	—	—	—	—	—	—	672	—	—	—	—	224	896
Superphosphate	—	224	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	224
Tri-Sodium Phosphate	28,448	—	—	48,384	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	76,832

* 1,516 Tons Spoilt Canes ground and juice ditched.

TABLE IV

Factory Analytical Data—1960 Crop

	Mony-musk	Rich-mond/ Llan-dovery	Jamaica Sugar Estates	Frome	New Yar-mouth	Cay-manas	Inns-wood	Bar-nett	Worthy Park	Rose Hall	Gray's Inn Central	Sevens	By-brook	Serge Island	Vale Royal	Apple-ton	Hamp-den	Ber-nard Lodge	Holland	Long Pond	Averages
Cane																					
Pol %	11·05	11·32	10·49	11·83	11·80	11·70	11·72	11·82	14·01	11·04	10·13	11·58	12·14	12·49	10·10	13·03	11·08	11·93	12·28	10·18	11·59
Fibre %	13·80	13·32	13·74	14·54	14·92	14·03	13·03	13·07	12·79	13·97	15·07	13·01	13·40	14·80	14·82	14·25	14·75	15·69	13·84	14·17	14·22
Bagasse																					
Pol %	2·20	1·81	2·53	2·29	2·54	2·24	2·77	2·95	3·03	2·86	2·17	2·91	2·85	2·62	2·47	2·89	2·57	2·92	3·99	3·26	2·52
Moisture %	51·81	46·29	44·84	48·45	47·23	48·00	47·97	47·06	45·18	46·99	46·53	50·3	46·01	46·72	45·85	46·60	49·24	49·48	46·54	46·83	48·54
Juices																					
First Exp. °Brix ..	17·51	16·83	16·13	18·31	18·12	18·06	18·05	17·57	19·54	17·13	16·68	17·99	18·04	18·69	15·82	18·83	17·11	19·04	18·11	15·83	17·83
Pol % ..	13·69	14·16	12·70	14·97	14·85	15·05	14·61	14·65	17·18	13·98	13·41	14·58	15·09	15·90	12·84	16·48	14·21	15·73	15·15	12·72	14·55
App. Purity ..	78·21	84·13	78·74	81·76	81·95	83·33	80·94	83·38	87·92	81·61	80·39	81·03	83·65	85·07	81·16	87·52	83·05	82·61	83·66	80·35	81·58
Absolute °Brix ..	16·81	15·91	15·92	17·33	17·33	16·67	17·04	16·65	18·69	16·14	15·36	16·88	17·11	17·54	14·99	17·81	16·15	17·57	17·49	15·14	16·90
App. Purity ..	76·28	82·09	76·38	79·85	80·03	81·66	79·10	81·68	85·93	79·49	77·59	78·85	81·94	83·58	79·12	85·29	80·50	80·50	81·48	78·35	79·63
Mixed °Brix ..	16·18	13·99	14·17	15·48	15·77	14·87	15·37	15·18	16·34	14·64	14·39	14·98	16·09	15·61	13·64	15·75	14·09	15·84	15·73	13·02	15·37
App. Purity ..	76·63	82·34	76·84	80·36	80·41	81·96	79·41	82·02	86·23	79·85	78·16	79·31	82·35	84·05	79·54	85·59	80·98	80·98	81·82	78·72	80·05
R.S. Pol Ratio ..	10·40	8·41	11·82	11·41	8·30	8·06	8·47	7·82	4·89	—	8·53	9·60	8·30	7·01	10·23	6·99	—	8·43	9·17	11·07	9·49
Last Exp. °Brix ..	4·24	2·28	5·50	4·96	4·31	4·30	5·03	5·91	4·25	4·49	3·79	5·05	5·35	5·35	4·27	5·82	4·59	6·58	11·26	6·65	—
App. Purity ..	70·97	76·91	70·55	72·05	75·61	76·72	74·95	77·01	80·94	75·00	70·23	73·69	76·82	76·60	74·27	81·16	74·70	75·53	78·54	74·92	—
Evaporator Supply																					
°Brix ..	16·12	14·33	14·03	15·70	15·76	14·54	15·03	16·13	16·35	15·74	14·00	15·23	16·00	17·02	13·79	16·15	13·93	15·86	15·27	13·00	—
App. Purity ..	77·80	82·62	78·26	80·89	80·90	82·54	79·91	82·20	87·09	80·66	79·49	80·03	82·84	84·62	80·30	86·50	80·92	82·03	81·08	79·08	—
Syrup °Brix ..	56·09	64·66	58·59	58·37	61·68	62·52	60·10	55·20	57·08	62·14	62·81	65·63	65·91	63·61	60·67	65·25	66·05	62·66	60·16	56·80	—
App. Purity ..	77·61	82·94	79·76	82·03	80·85	83·18	80·43	82·94	87·51	80·97	80·21	80·79	83·36	84·85	80·92	87·20	82·69	82·56	82·26	79·60	—
Filter Cake Pol % ..	1·69	4·11	2·06	1·19	2·32	1·80	1·53	1·73	4·61	2·08	2·51	1·56	2·04	2·13	2·36	1·66	3·02	1·13	5·95	4·69	1·85
Moisture % ..	78·60	76·83	69·60	76·69	76·07	70·45	71·64	76·58	61·12	72·60	66·20	72·79	76·22	77·26	67·77	76·84	71·83	73·69	62·09	—	75·14
Sugars																					
Export Pol % ..	97·69	—	97·06	96·55	97·49	96·87	96·30	97·13	96·92	96·81	96·98	97·43	97·17	97·73	—	97·26	97·11	97·09	96·16	97·21	—
All Pol % ..	98·18	96·79	97·06	96·54	97·50	97·03	96·30	97·13	97·10	96·81	96·69	97·36	97·15	97·73	96·79	96·79	97·10	97·17	96·16	97·21	97·15
Export Moisture% ..	0·53	—	0·94	0·79	0·59	0·78	0·84	0·79	0·80	0·81	0·70	0·66	0·77	0·68	—	0·81	0·76	0·81	1·02	0·66	—
All Moisture % ..	0·42	0·84	0·94	0·79	0·58	0·77	0·84	0·77	0·74	0·81	0·78	0·67	0·78	0·68	0·71	0·85	0·76	0·79	1·02	0·66	0·71
Final Molasses																					
°Brix	92·73	87·48	87·71	88·06	90·31	91·45	90·75	89·29	88·98	88·99	88·64	89·71	88·47	87·47	86·32	86·91	87·37	91·60	84·01	87·76	89·69
App. Purity	34·55	32·74	30·54	31·68	31·94	32·61	32·58	32·34	34·23	31·31	31·01	30·42	32·61	31·99	30·61	31·10	31·84	35·76	37·29	31·15	32·66

TABLE V

Factory Control Data—1960 Crop

	Mony-musk	Rich-mond/ Llan-dovery	Jamaica Sugar Estates	Frome	New Yar-mouth	Cay-manas	Inns-wood	Bar-nett	Worthy Park	Rose Hall	Gray's Inn Central	Sevens	By-brook	Serge Island	Vale Royal	Apple-ton	Hamp-den	Ber-nard Lodge	Holland	Long Pond	Averages
Control Classification																					
Cane																					
Fibre/Pol Ratio	1·25	1·18	1·31	1·23	1·26	1·20	1·11	1·11	0·91	1·27	1·49	1·12	1·10	1·18	1·47	1·09	1·33	1·32	1·13	1·39	1·23
Tons Cane/Ton 96° Sugar ..	10·86	9·89	11·36	9·75	9·74	9·77	9·99	9·77	7·89	10·86	11·60	10·23	9·47	9·04	11·61	8·58	10·75	9·91	10·27	11·83	10·13
Demerara Index	21·91	21·21	21·85	21·58	21·54	21·47	21·71	21·59	21·90	21·90	21·73	21·81	21·61	21·53	21·71	21·90	21·83	21·84	22·55	22·01	21·72
Java Ratio	80·72	79·94	82·60	79·02	79·46	77·74	80·22	80·68	81·55	78·97	75·54	79·42	80·45	78·55	78·66	79·07	77·97	75·84	81·06	80·03	79·66
Milling																					
Tons Cane/Hour	170·64	31·84	67·74	236·07	67·69	48·52	46·22	33·04	39·31	28·44	52·36	69·81	47·76	45·16	36·45	56·32	60·23	92·90	21·64	34·12	66·22
Tons Fibre/Hour	23·50	4·24	9·31	34·36	10·08	6·77	6·02	4·32	5·03	3·96	7·89	9·09	6·40	6·68	5·40	8·02	8·88	14·57	3·00	4·84	9·42
Imbibition % Cane	14·31	20·13	16·82	19·59	17·22	19·36	16·90	15·24	19·06	15·82	14·16	18·82	12·59	18·95	15·62	19·08	21·29	18·93	15·18	19·13	17·38
Imbibition % Fibre	103·69	151·12	122·40	134·72	115·38	137·92	129·68	116·58	148·95	113·71	94·00	144·64	93·98	128·00	105·39	133·90	144·31	120·69	109·68	134·97	122·25
Pol Extraction	93·91	95·84	93·57	94·19	93·50	94·53	93·64	93·36	94·58	92·67	93·59	92·89	93·75	93·76	92·87	93·65	92·77	91·76	90·70	90·72	93·57
Reduced Pol Extraction ..	94·57	96·13	94·23	95·12	94·70	95·21	93·94	93·69	94·72	93·52	94·84	93·21	94·23	94·87	94·15	94·54	94·03	93·68	91·73	91·97	94·46
Absolute Juice Lost % Fibre ..	38·04	27·07	40·37	34·15	37·07	33·52	42·45	44·16	36·96	45·37	36·12	47·54	40·40	35·92	40·98	38·21	41·80	44·28	57·90	56·21	38·79
Bagasse % Cane	30·59	25·94	26·65	30·05	30·20	28·60	26·95	26·62	25·05	28·28	29·91	28·28	26·66	29·68	29·17	29·43	32·98	33·63	28·62	29·03	29·58
Time Grinding % Gross G.T. ..	78·17	64·53	54·25	75·65	71·81	66·56	78·54	65·98	74·57	72·94	71·20	71·25	73·41	69·84	72·48	76·01	69·84	71·95	71·81	68·04	71·11
Purity Drop																					
First Expressed—Mixed ..	1·58	1·79	1·90	1·40	1·54	1·37	1·53	1·36	1·69	1·76	2·23	1·72	1·30	1·02	1·62	1·93	2·07	1·63	1·84	1·63	1·53
First Expressed–Last Expressed	7·24	7·22	8·19	9·71	6·34	6·61	5·99	6·37	6·98	6·61	10·16	7·34	6·83	8·47	6·89	6·36	8·35	7·08	5·12	5·43	—
Boiling House																					
Tons Brix/Hour..	23·07	4·20	8·65	16·41	9·29	6·51	6·39	4·44	6·04	3·64	6·35	9·47	6·60	6·29	4·30	8·03	7·65	12·56	2·95	3·84	8·97
Tons 96° Sugar/Hour ..	15·68	3·22	5·96	12·14	6·95	4·94	4·63	3·38	4·98	2·62	4·51	6·82	5·04	4·99	3·14	6·17	5·29	9·38	2·11	2·77	6·54
Filter Cake % Cane	3·23	1·64	3·19	2·43	2·96	3·08	1·95	3·51	1·46	1·52	2·19	3·02	2·75	2·49	1·93	2·96	2·67	2·98	1·37	1·08	2·68
Gallons Final Molasses at 88° Brix/Ton 96° Sugar	76·71	47·75	64·20	55·35	54·03	52·38	61·03	49·60	33·11	62·23	65·73	65·24	52·42	50·76	64·27	38·40	68·95	53·69	55·35	62·51	59·45
Efficiency (W.C.)	96·13	97·55	97·52	97·85	98·44	96·94	97·60	97·13	97·65	95·75	98·04	96·93	96·99	97·40	98·06	94·88	94·95	97·19	92·00	98·16	96·68
Purity Rise: Mixed Syrup ..	0·98	0·60	2·92	1·67	0·44	1·22	1·02	0·92	1·28	1·12	2·05	1·48	1·01	0·80	1·38	1·61	1·71	1·58	0·44	0·88	—
Pol Balance (in Cane)																					
% in Sugars	79·26	85·44	80·21	83·15	83·08	83·58	81·92	82·75	86·46	79·83	81·51	80·65	83·13	84·40	76·03	See	79·57	80·81	76·03	79·41	81·44
% in Molasses	12·74	8·03	9·49	8·76	8·65	9·09	9·78	7·99	5·98	9·45	10·00	9·63	8·62	8·22	9·40	below	10·05	9·34	10·57	9·30	9·47
% in Filter Cake	0·48	0·60	0·62	0·23	0·58	0·47	0·26	0·51	0·48	0·29	0·54	0·43	0·46	0·42	0·66		0·73	0·28	0·66	0·50	0·43
% in Bagasse	6·09	4·16	6·43	5·81	6·50	5·47	6·36	6·64	5·42	7·33	6·41	7·11	6·25	6·24	9·30		7·23	8·24	9·30	9·28	6·43
% Undetermined	1·43	1·77	3·25	2·05	1·19	1·39	1·68	2·11	1·66	3·10	1·54	2·18	1·54	0·72	4·61		2·42	1·33	3·44	1·51	2·23

Monymusk's Pol Balance to read:—
% in Sugars .. 79·26
% in Molasses .. 12·42
% in Filter Cake .. 0·48
% in Bagasse .. 6·09
% Undetermined .. 1·26

Refinery:—
% in Filter Cake .. —
% in Molasses .. 0·32
% Undetermined .. 0·17

Appleton's Pol Balance to Read:—
% Pol Recovered in Sugars .. .. 80·52
% Pol Lost in Final Molasses .. 4·01
% Pol Lost in Filter Cake .. .. 0·37
% Pol Lost in Bagasse.. .. .. 6·34
% Pol in Mixed Juice to Distillery .. 2·66

% Pol in Clarified and Cloudy Juice to Distillery .. .. 0·30
% Pol in Syrup to Distillery .. .. 0·15
% Pol in A Molasses .. .. .. 0·08
% Pol in B Molasses .. .. .. 4·21
% Undetermined Loss .. .. .. 1·36

TABLE VI

NON-FACTORY STOPPAGES AND TIME GRINDING % GROSS GRINDING TIME—1960 CROP

% (as reported by the Factories)

Factories	Field stoppages	Trans-portation	Pre-meditated	Rain	Labour	End of run	Nett grinding time	Time grinding
Monymusk	2·46	0·15	5·38	6·82	0·94	4·15	80·10	78·17
Richmond/Llandovery ..	5·73	—	3·06	2·36	—	14·62	74·23	64·53
Jamaica Sugar Estates ..	3·16	—	2·79	8·37	0·95	7·23	77·50	54·25
Frome	0·81	0·44	10·41	4·18	—	2·27	81·89	75·65
New Yarmouth	3·64	—	2·79	8·23	5·82	5·80	73·72	71·81
Caymanas	2·90	—	1·09	6·64	13·22	6·27	69·88	66·56
Innswood	2·59	—	1·14	3·77	0·01	7·20	85·29	78·54
Barnett	15·17	—	2·67	0·02	—	7·32	74·82	65·98
Worthy Park	6·19	—	1·28	2·36	4·97	4·88	80·32	74·57
Rose Hall	4·05	—	2·93	1·76	0·11	8·38	82·77	72·94
Gray's Inn Central ..	2·31	—	—	11·57	—	11·25	74·87	71·20
Sevens	5·60	—	0·91	5·28	3·28	5·50	79·43	71·25
Bybrook	7·21	—	1·02	—	—	5·82	85·95	73·41
Serge Island	6·52	—	3·50	4·91	—	7·03	78·04	69·84
Vale Royal	3·38	—	2·46	3·33	—	6·18	84·65	72·48
Appleton	0·96	—	6·62	0·75	—	6·70	84·97	76·01
Hampden	4·31	—	2·72	1·86	8·60	4·35	78·16	69·84
Bernard Lodge	2·09	—	1·59	9·05	—	7·06	80·21	71·95
Holland	1·01	—	2·70	6·22	3·23	6·62	80·22	71·81
Long Pond	1·50	—	3·22	2·69	2·23	3·86	86·50	68·04
ISLAND AVERAGES ..	3·81	0·06	3·35	4·64	2·12	6·18	79·84	71·11

NOTE. Gross Grinding Time = Interval between commencement and termination of milling.
Nett Grinding Time = Possible Grinding Time.
Time Grinding = Actual Grinding Time.

TABLE VII

FACTORY STOPPAGES AND TIME GRINDING % NETT GRINDING TIME

Factories	Mechanical	Electrical	Chokes	Juice room	Steam	Other reasons	Time grinding
Monymusk	1·97	0·03	0·29	0·02	0·09	—	97·60
Richmond/Llandovery ..	5·57	—	0·28	3·10	3·88	0·24	86·93
Jamaica Sugar Estates ..	22·51	0·69	1·26	0·01	4·10	1·43	70·00
Frome	2·21	0·46	0·40	0·12	0·22	4·20	92·39
New Yarmouth	2·11	0·14	0·12	0·14	0·03	0·05	97·41
Caymanas	2·70	0·26	0·67	0·39	0·12	0·62	95·24
Innswood	5·46	0·22	0·96	0·63	0·27	0·37	92·09
Barnett	9·04	—	0·34	1·27	0·16	1·01	88·18
Worthy Park	4·04	—	0·29	1·29	0·83	0·71	92·84
Rose Hall	7·47	0·77	0·81	0·74	1·85	0·24	88·12
Gray's Inn Central	1·59	0·55	1·16	0·01	0·37	1·22	95·10
Sevens	7·12	0·22	0·96	1·01	0·30	0·69	89·70
Bybrook	11·61	0·16	1·32	0·19	0·34	0·98	85·40
Serge Island	4·33	0·41	1·53	2·35	0·13	1·76	89·49
Vale Royal	6·97	1·07	0·92	2·00	0·99	2·42	85·63
Appleton	7·62	0·18	1·75	0·80	0·06	0·14	89·45
Hampden	5·93	0·96	0·91	1·73	0·68	0·44	89·35
Bernard Lodge ..	8·77	0·19	0·39	0·35	0·20	0·40	89·70
Holland	11·92	0·12	1·92	0·94	4·18	3·33	77·59
Long Pond	15·95	—	0·66	1·10	0·82	2·81	78·66
ISLAND AVERAGES ..	6·77	0·34	0·84	0·80	0·84	1·34	89·07

SUMMARY

Time Grinding	65020·30 Hours	
Factory Stoppages	7976·68 "	= 8·72% Gross Grinding Time.
Nett Grinding Time	72996·98 "	
Non-Factory Stoppages ..	18435·30 "	= 20·16% Gross Grinding Time.
Gross Grinding Time	91432·28 Hours	

PART 3

DISTILLERY DATA—1960 CROP

TABLE I

Distillery Capacities

		Money-musk	Richmond/ Llandovery	Jamaica Sugar Estates	Frome	New Yarmouth	Caymanas	Innswood	Barnett	Worthy Park	Rose Hall	Gray's Inn Central	Sevens	Bybrook	Serge Island	Vale Royal	Appleton	Hampden	Bernard Lodge	Holland	Long Pond	Totals
Fermentation																						
Vats	No. Off.	30	40	9	43	37	21	15	18	10	12	9	18	15	10	20	22	61	44	14	90	538
Total Capacity	gal.	362,000	50,900	125,000	171,800	65,500	108,750	120,000	36,000	20,000	36,000	90,000	46,042	42,600	70,000	34,230	82,800	140,000	132,000	12,600	174,000	1,920,222
Dunder Boxes	No. Off.	4	10	6	7	5	5	4	10	5	11	—	—	4	3	8	—	6	12	8	15	116
Total Capacity	gal.	12,000	20,000	65,000	19,600	5,000	18,375	10,000	5,000	9,000	13,200	—	—	7,000	10,000	8,800	—	12,000	36,000	2,500	12,000	265,475
Cooling Surface	sq. ft.	—	—	150	—	—	800	—	—	—	—	—	—	—	—	—	—	840	—	—	—	1,790
Distillation																						
Wash Preheater	**No. 1**																					
Capacity	gal.	2,200	1,500	—	3,800	4,500	3,000	—	Tubular	1,500	—	Cont.	2,417	—	—	850	300	—	3,000	—	—	23,067
	sq. ft. H.S.	135	831	1	166	—	100	—	—	—	—	330	51	—	—	40	—	—	250	—	—	1,903
	No. 2																					
Capacity	gal.	2,200	1,500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3,700
	sq. ft. H.S.	135	585	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	720
Still No. 1																						
Loading Capacity	gal.	2,000	1,500	2,500	2,000	1,500	1,500	2,500	1,800	1,300	1,500	—	1,780	1,237	1,500	1,500	1,500	2,000	1,380	1,000	1,200	31,197
	sq. ft. H.S.	263	—	104	263	300	105	—	200	65	100	—	—	240	98	80	90	—	112	—	—	—
L.W. Retort	gal.	250	180	350	240	180	175	300	220	150	180	—	230	140	175	100	180	250	168	120	120	3,708
	sq. ft. H.S.	—	—	4·2	11	—	3·6	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—
H.W. Retort	gal.	200	150	240	220	150	150	250	180	120	120	—	190	120	140	64	150	200	140	100	100	2,984
	sq. ft. H.S.	—	—	—	8	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—
Condenser	sq. ft. C.S.	340	2,660	766	340	—	—	—	470	—	—	—	355	752	185	—	—	—	—	—	—	5,868
Still No. 2																						
Loading Capacity	gal.	2,000	1,500	2,500	2,000	1,500	1,500	—	—	—	1,500	—	1,780	1,237	3,500	1,500	1,200	1,500	1,380	—	1,000	25,597
	sq. ft. H.S.	263	—	104	135	300	105	—	—	—	95	—	—	240	200	80	65	—	112	—	—	—
L.W. Retort	gal.	250	180	350	240	180	175	—	—	—	180	—	230	140	350	100	150	200	168	—	100	2,993
	sq. ft. H.S.	—	—	4·2	11	—	3·6	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—
H.W. Retort	gal.	200	150	240	220	150	150	—	—	—	120	—	190	120	280	64	130	150	140	—	80	2,224
	sq. ft. H.S.	—	—	—	8	—	—	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—
Condenser	sq. ft. C.S.	340	1,916	766	340	—	—	—	—	—	—	—	351	752	220	—	—	—	—	—	—	4,685
Still No. 3																						
Loading Capacity	gal.	2,000	—	2,500	2,000	1,200	—	—	—	—	—	—	—	—	—	—	2,000	1,500	1,380	—	1,500	14,080
	sq. ft. H.S.	263	—	104	135	300	—	—	—	—	—	—	—	—	—	—	—	—	112	—	—	—
L.W. Retort	gal.	250	—	350	240	140	—	—	—	—	—	—	—	—	—	—	171	—	112	—	—	1,773
	sq. ft. H.S.	—	—	4·2	11	—	—	—	—	—	—	—	—	—	—	—	275	200	168	—	150	—
H.W. Retort	gal.	200	—	240	220	120	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,410
	sq. ft. H.S.	—	—	—	8	—	—	—	—	—	—	—	—	—	—	—	220	150	140	—	120	—
Condenser	sq. ft. C.S.	340	—	766	340	230	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Still No. 4																						
Loading Capacity	gal.	2,000	—	—	2,000	1,500	—	—	—	—	—	—	—	—	—	—	2,000	1,000	1,500	—	—	10,000
	sq. ft. H.S.	263	—	—	263	300	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
L.W. Retort	gal.	250	—	—	240	180	—	—	—	—	—	—	—	—	—	—	171	—	125	—	—	1,275
	sq. ft. H.S.	—	—	—	11	—	—	—	—	—	—	—	—	—	—	—	275	150	180	—	—	—
H.W. Retort	gal.	200	—	—	220	150	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1,020
	sq. ft. H.S.	—	—	—	8	—	—	—	—	—	—	—	—	—	—	—	220	80	150	—	—	—
Condenser	sq. ft. C.S.	340	—	—	340	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Still No. 5																						
Loading Capacity	gal.	—	—	—	2,000	—	—	—	—	—	—	—	—	—	—	—	—	1,500	2,000	—	—	5,500
	sq. ft. H.S.	—	—	—	135	—	—	—	—	—	—	—	—	—	—	—	—	—	150	—	—	—
L.W. Retort	gal.	—	—	—	240	—	—	—	—	—	—	—	—	—	—	—	—	200	250	—	—	690
	sq. ft. H.S.	—	—	—	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
H.W. Retort	gal.	—	—	—	220	—	—	—	—	—	—	—	—	—	—	—	—	150	200	—	—	570
	sq. ft. H.S.	—	—	—	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Condenser	sq. ft. C.S.	—	—	—	340	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	340
Still No. 6																						
Loading Capacity	gal.	—	—	—	2,000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2,000
	sq. ft. H.S.	—	—	—	135	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
L.W. Retort	gal.	—	—	—	240	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	240
	sq. ft. H.S.	—	—	—	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
H.W. Retort	gal.	—	—	—	220	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	220
	sq. ft. H.S.	—	—	—	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Condenser	sq. ft. C.S.	—	—	—	340	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	340
Continuous Still																						
No. of Columns		2	—	—	—	—	1	2	—	—	—	2	—	—	—	—	4*	—	—	—	3	14
Wash/24 hours	gal.	48,000	—	—	—	—	40,000	40,000	—	—	—	40,000	—	—	—	—	—	—	—	—	1,200	169,200

TABLE II

Distillery Quantities—1960 Crop

(As supplied by the Factories)

		Monymusk		Jamaica Sugar Estates	Frome	New Yarmouth	Innswood		Worthy Park	Rose Hall	Gray's Inn Central	Sevens	Bybrook	Serge Island	Bernard Lodge
		Pot Still	Col. Still Rum and Alcohol				Pot Still	Alcohol							
Cane Juice used	tons	161·82	—	—	144·63	—	—	—	—	—	—	—	—	—	—
Molasses used at 88°Brix	gal.	338,421	795,823	192,050	341,430	505,283	45,765	83,624	118,065	9,600	559,643	36,657	297,040	130,559	322,118
Rum Produced as Distilled Bulk	gal.	109,707	192,595	57,794	112,064	145,215	16,164	—	29,197	1,301	—	9,455	79,497	40,136	90,761
Rum produced as Distilled Proof	gal.	162,095	300,118	81,798	156,890	203,300	24,532	—	45,680	1,913	—	13,965	118,848	59,864	134,326
Alcohol produced as Distilled Bulk	gal.	—	—	—	—	—	—	16,624	—	—	156,615	—	—	—	—
Alcohol produced as Distilled Proof	gal.	—	—	—	—	—	—	27,976	—	—	262,666	—	—	—	—
Gal. Molasses at 88°Brix/gal. Proof Rum		2·09	2·65	2·35	2·18	2·49	1·87	2·99	2·58	5·02	2·13	2·62	2·50	2·18	2·40